The Engineering and Mining Journal

VOLUME 96 OCTOBER 18, 1913 NUMBER 16

Southwestern Portland Cement Works

By Charles A. Smith*

SYNOPSIS—Description of the plant and method of operation of a large cement works near El Paso, Tex. Lime rock is mined from a nearby open cut and trammed to the works where it is blended, ground, burned and reground into marketable product. The plant is modern and efficient.

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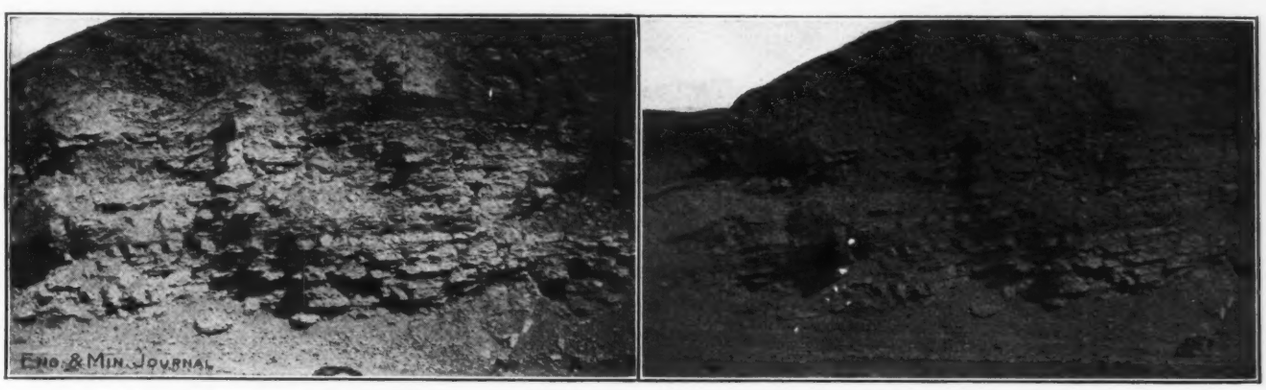
The quarry and factory of the El Paso Portland Cement Co. are situated just west of El Paso, Tex. The raw material secured from the quarry is an argillaceous lime shale of the Comanche series lying in well defined beds having a dip of about 15°, and carrying up to 90% $CaCO_3$. The rock is more or less irregular in composition. The mixture best suited for the cement contains 75% $CaCO_3$ and 25% argillaceous and other matter and a considerable proportion of the shipments from the quarry give approximately this analysis. The bulk of the raw material used, however, is made up of run-of-mine rock (which varies widely from the standard requirements) mixed with high- or low-lime material, as the case may require, to produce a mixture of the proper composition.



Limestone Deposit, Southwestern Portland Cement Co., El Paso, Texas

Limestone Obtained from a Quarry

The quarry is a plain opencut driven into the hill, its main floor some 10 ft. above the railroad grade. Breaking is done from the bank onto this floor by means of holes from 25 to 100 ft. deep drilled by a Rockford well driller using a 5⅝-in. bit. A common charge for a deep hole consists of 100 kegs of black powder placed at the bottom and on top of this enough No. 6 Monobel to fill it to within 15 ft. of the collar. Three electric primers are used in each hole and up to three holes are shot at once. The breaking efficiency runs from 5 to 7 tons of rock per pound of explosive used.

The broken rock, drilled with plug drills and shot when necessary, is handled in 1-yd. capacity carts and dumped into the 2-yd. capacity larries, which take it to the factory. These cars move in a timbered tunnel or ditch run on the railroad grade 10 ft. below the main floor of the quarry, and partially covered on top so that the carts can be backed up and dumped into the middle of the larries. When the main floor becomes too extended, or, in other words, when the breaking face gets too far away from the edge of the main floor, the latter is quarried back and shoveled directly into the larries.

The mucking is done entirely by contract. The men work in pairs and are paid 8c. per cart. They fill from 30 to 55 carts per pair per shift. When the train runs steadily taking away the muck as fast as they handle it, they easily fill from 40 to 55 carts. Their wages vary from $1.25 to $2.25 each, and average about $1.80 each per day. The contract system seems to work most satisfactorily. The efficiency runs up to 35 tons per day per shoveler and up to 20 tons per day per man, including shovelers, bosses, mule drivers, tally men, train crew and all. The muckers are Mexicans, the rest are chiefly Americans.

At the factory the rock is dumped at the side of the track and shoveled directly into two No. 6 Gates gyratory breakers set with their tops level with the ties, which

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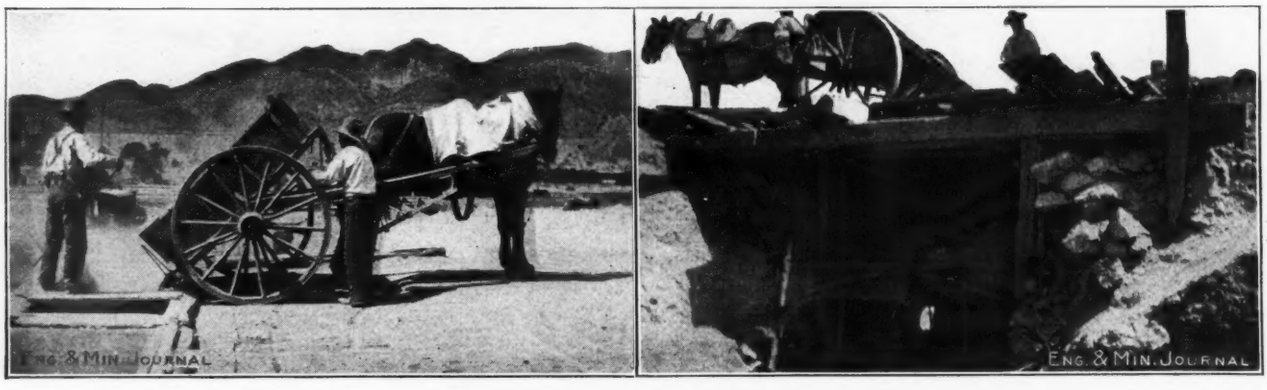
break it to pass a 2½-in. ring. From each crusher the rock goes to a steel-cased link-and-bucket elevator, is hoisted into a hopper and fed to a set of Crescent heavy-duty rolls, size 16x36 in., running at 78 r.p.m., which reduce it to ¾ in. From the rolls it is taken by a Webster bucket conveyor to the six first-blending bins, 750 tons capacity each.

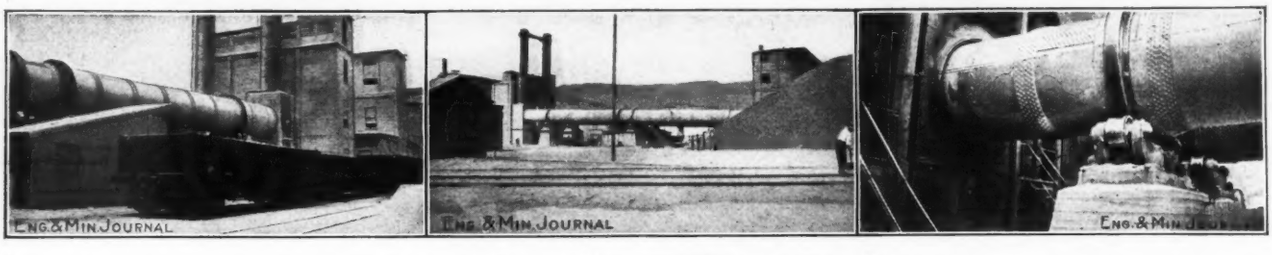
Rock Is Carefully Sampled and Measured

Before reaching the blending bins the rock is sampled. To make up this sample every thirtieth bucket on the conveyor is tripped into one of two receiving hoppers, one for each alternate hour.

Loading and Carting the Quarried Rock



Dumping from Cart into Larry



Burning Kilns, Southwestern Cement Co.

At the end of each hour the sample is drawn from the hopper and run through a fine-grinding Williams mill. From the mill it is sent to a Vezin sampler, which cuts out one-thirtieth as a sample, and the latter is run through a mixing drum and thence through a second Vezin sampler, which turns out a sample amounting to one-ten thousandth of the rock crushed during the shift. This sample is assayed each hour for lime and the rock dumped into the high-lime, low-lime or run-of-mine bedding bins, accordingly.

The first-blending bins are filled as indicated above, and on the flow sheet, with rock of a high lime content in one bin, rock of a low lime content in one bin and run-of-mine rock in the remaining four bins. Through a careful mixing of these three classes of material a regular product containing the proper proportions of lime and other matter is obtained for the final-blending bins.

The rock is drawn from the first-blending bins onto the bucket conveyor, as indicated on the flow sheet, dumped into an elevator, hoisted into a hopper and thence delivered by means of a swinging spout to any one of three hoppers which handle, respectively, the high-lime, low-lime and run-of-mine rock. These hoppers discharge through three Richardson automatic-measuring devices, respectively, having open indicators, showing at a glance what amount of material has passed through them and with their aid the mixture in the final-blending bins is regulated.

After passing the measuring devices the rock is taken on a short belt conveyor to an elevator, hoisted into a hopper, run through a sample mill and thence taken by a belt conveyor to the final-blending bins. The sample taken here is a good one. The entire stream of material is run through a Vezin, which cuts out one-tenth. This is then put through a mixing drum and then through a second Vezin, which cuts out another one-tenth, which last is collected in one of two hoppers, one for each ½-hr. period. At the end of each period the material in the corresponding hopper is run through a fine-grinding

Williams mill, thence through a Vezin sampler, which cuts out one-tenth, and thence through a mixing drum and another Vezin sampler, which cuts out a final one-tenth, making a final sample of one-ten thousandth of the rock treated. This sample is assayed every ½ hr. for lime and the correct mix maintained by varying the proportions of material taken from the high-lime, low-lime and run-of-mine bins, respectively. The ½-hr. interval effects a correction on every 3 in. of material in the final-blending bins.

Regarding the sampling it is to be noted that at the first sample mill the entire reject, amounting to about 3% of the total run, and at the second mill the last two rejects, amounting to about 1% of the total run, go back into the conveyor or elevator and are returned through the sample mill. Apparently this does not affect the accuracy of the result to any appreciable extent.

From the final-blending bins, the rock is drawn onto a conveyor belt, carried to an elevator, hoisted and discharged into a 75-ton hopper, which feeds the drying kiln. The dryer is of the rotary type, 6 ft. inside diameter by 60 ft. long, set with an inclination of ¾-in. per ft. and revolving at the rate of three r.p.m. It handles about 30 tons of rock per hour, drives off from 2½ to 3¼% of moisture, consumes about 15 lb. of coal per ton of rock dried and delivers the dried product at a temperature varying from 260 to 320° F.

The product from the dryer is carried by a link and bucket conveyor to an elevator, hoisted to a small storage bin and taken from this by a mixing screw conveyor and discharged into four hoppers each feeding two Fuller raw-grinding mills. These machines run at about 140 r.p.m., and with a single grinding make a product running from 96% to 97% through 100-mesh, and from 86% to 89% through 200-mesh. The material is not reground. The product is assayed every hour for lime and fineness. The wear on the mills is small, the shoes and balls lasting about 2000 working hours and the die-rings lasting indefinitely. The mills are each driven by a single Westinghouse vertical-shaft motor of 90 hp., and running at 380 r.p.m.

The product from the mills runs into a collecting box, is taken from this by a screw conveyor to a link-and-bucket elevator, hoisted and discharged into a storage bin and fed from this by a variable-speed screw conveyor directly into the burning kilns. This screw conveyor is controlled by the attendant, who looks after the burning operation and regulates its speed and, consequently, the rate of feed, according to the condition of the charge in the kiln.

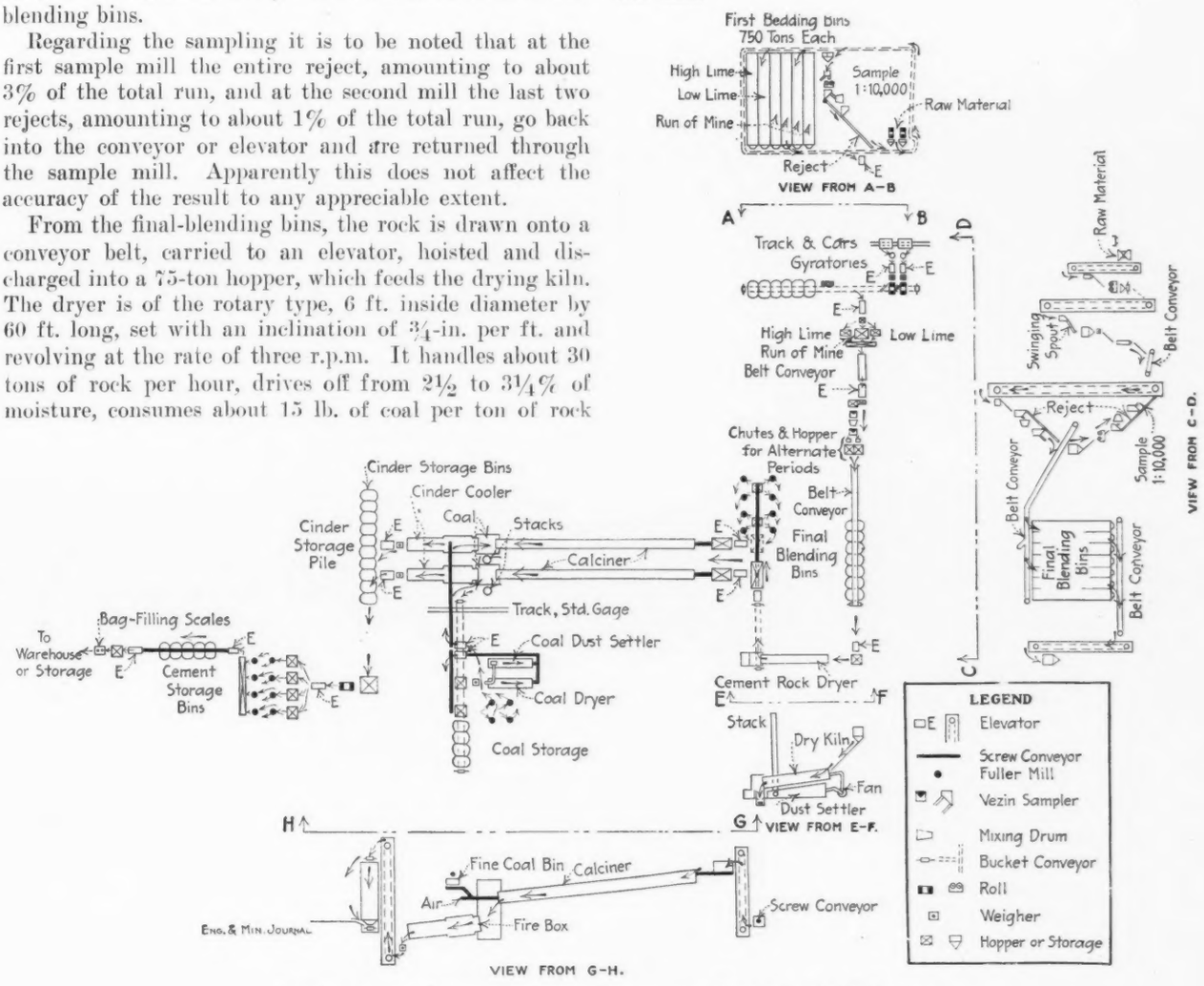


DIAGRAM OF SOUTHWESTERN PORTLAND CEMENT CO.'S PLANT

Just before entering the kiln, the mix is sampled and assayed every hour for lime. The kiln is of the rotary type, three-tired, 8 ft. inside diameter by 150 ft. long, slopes ½ in. to the foot and is rotated at a speed varying from one revolution in 50 sec. to one revolution in 3½ min. The rotation is done by a variable-speed motor controlled by the burner attendant. The fuel used is powdered coal blown in by air delivered by a rotary fan. Figures on the consumption of coal could not be obtained. The lining of the kiln is comparatively durable. In the burning zone, the first 15 or 20 ft., it lasts from three months to one year, and the rest of the lining lasts indefinitely.

The capacity of each kiln was placed at approximately 800 bbl. of clinker, burned rock, per 24 hr. The burning is a somewhat delicate operation. The object of it is to

drive off the CO_2, and at the same time effect only a slight fusion of the lime and clay forming the anhydrous tri-calcium silicate. Every hour a sample is taken of the calcined material as it leaves the kiln, and every 12 hr. these samples are combined and assayed for lime.

From the kilns the calcined rock, now called clinker or cinder, is discharged into two rotary coolers (similar to the kilns), cooled at their upper ends by outside water sprays, thence to two automatically registering rotary weighers, thence to two link-and-bucket elevators, which discharge it onto a single link-and-bucket conveyor serving the clinker-storage bins and the stock pile. The latter is built up in front of and against the bins by tripping the conveyor over suitable chutes, which throw the clinker outside of and in front of the bins instead of in them, and it is taken down, with more or less handling, through chutes cut to the conveyor under the bins. It is interesting to note that water does not affect the unground clinker, and it can be kept in the stock pile indefinitely.

Grinding after Burning

From the storage bins or the stock pile the clinker is conveyed and elevated to a hopper, passed through a set of rolls and thence to an elevator and screw conveyor, which latter distributes it to four bins, each feeding two Fuller mills, the general arrangement and drive of the elevators and mills being similar to that in the raw-grinding plant. Of the eight mills, six are 42-in., running 160 r.p.m., and two are 54-in., running 130 r.p.m. The wear on the mills is much greater than in raw-grinding, the shoes and balls having a life of only about 300 working hours and the die rings a life of only about a year. The clinker is ground only once, the single grinding producing 94% through 100-mesh and 79% through 200-mesh. The standard cement specifications call for 92% through 100-mesh and 75% through 200-mesh.

The product from the mills falls into a collecting box, is conveyed thence by a screw conveyor to an elevator, discharged onto another screw conveyor, which latter takes it to the final cement-storage bins. From the bottom of these bins it is drawn through chutes onto another screw conveyor, conveyed to an elevator and raised and dumped into a hopper which feeds the packing apparatus.

The packing apparatus consists essentially of a scale set to trip and dump at a certain weight, and a spout for feeding the cement. The pan of the scale is made of a shape suitable for holding a bag of cement, and the spout is placed conveniently for filling the bag as it rests in the pan. The empty bag comes to the scales with its neck wired up and, inverted on the scales, it is filled from the spout through a hole in one of the lower corners. No tying is necessary to close the filling hole. In effect, there is attached to the filling hole on the inside of the bag a 4- or 5-in. length of cloth tubing. The filling spout is run in beyond the end of this tube (and when withdrawn the weight of the cement is sufficient to close it), when the bag is filled with the set weight of cement the scales trip, the run of cement through the filling tube is cut off, the pan tips and the bag falls out away from the filling spout and down through a short chute to the handlers and is taken directly to the cars or to the warehouse. The output of the factory is 40,000 bbl. per month, the barrels weighing 380 lb. each. The output per man is about 11 bbl. per shift.

Ground Coal Used as Burning Fuel

The general arrangement of the coal-grinding plant is also shown on the flow sheet. The coal is dumped directly from standard-gage cars into a link-and-bucket elevator-conveyor and taken to four storage bins of 400 tons capacity each. From these bins it is drawn through chutes onto the same elevator-conveyor, carried to a hopper, run through an automatic weigher and fed to a Cummer rotary-kiln coal dryer, having a dust-settling chamber attached. The dryer removes from 4% to 12% of moisture.

From the dryer the coal is taken by a screw conveyor to an elevator, discharged onto another screw conveyor, conveyed to two feed hoppers and fed to four Fuller mills. The mills grind it in one stage, so that 97% to 98% will pass 100-mesh and 87% to 90% will pass 200-mesh. From the mills it falls into a collecting box, is taken by a screw conveyor to an elevator, elevated and discharged onto another screw conveyor, which takes it to the fine-coal feed hoppers, whence it is fed by means of a variable-speed screw conveyor, controlled by the burner man, to the air-stream, which blows it into the kiln.

Well Driller for Putting in Blasting Holes

The air used to feed the fine coal to the kilns was formerly taken from two stacks, which handled the hot waste air from the clinker coolers. This did not give satisfactory results, and the air is now taken by the blower directly from the atmosphere. Of the gases from the coolers, as much as can be utilized is turned through the burning kilns, and the balance is wasted through the stacks.

The power house is steamed by Stirling boilers stoked by Green Engineering Co.'s chain stokers. These latter seem to have given complete satisfaction. The power available for running the factory is 1200 kw.

The plant has been in operation 3½ years.

For the above I beg to acknowledge my indebtedness to the courtesy of O. J. Binford, superintendent and secretary of the company, who gave me every opportunity to see the full working of the plant and process.

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Notes on Electric Pumps

By Sidney S. Walker*

Since their introduction some years ago, great improvement has taken place in both centrifugal and electrically driven plunger pumps. Theoretically, the high-speed centrifugal pump, with its motor direct-connected to the shaft, the whole forming a small and compact machine, would seem to be the superior type. It is now built in forms capable of high lift and its original efficiency running from 30 to 40% has been increased to 70%. These improvements are largely due to the competition of the triplex-plunger electrically driven pump, which in its turn has increased in efficiency from 66⅔% up to 80%, which is claimed with apparent justification. The improvement in both types is largely due to a better understanding of the principles involved and to improved design, together with improved methods of manufacture.

Mine pumping is usually arduous for the reason that the water is dirty and often carries corrosive salts and acids. The results of this are seen in the great wear on all water passages and in the tendency of the valves in particular to become defective and inoperative. For economical pumping, the movement of the water should be as smooth as possible in all portions of the pump, the supply and the delivery pipes, for the purpose of avoiding shock and eddy-currents, both of which consume power to no good purpose. Furthermore, when little shock has to be sustained, the whole system can be built lighter. Therefore, economy requires that the successive deliveries of water to the pipelines should be as frequent and as small as possible. The plunger pump is inherently defective in this respect, although, by the use of triplex plungers, the disadvantage is somewhat overcome. The reversal of direction of the water flow in the pump chambers is also an objectionable feature. Furthermore, defects in the gearings are likely to cause shock in the operation, which results in loss of power and a tendency to break both the pump and the delivery pipe. Modern tooth gearing, however, has been greatly improved so that the loss of power in this feature of the triplex pump is reduced almost to a minimum. Entrained air is sometimes a cause of difficulty and requires the addition of a special device to permit of its escape, so as not to interfere with the flow of water. On the other hand, an air chamber on the delivery side of the pipe is used to equalize the pressures between strokes of the pump, and is of advantage.

A point to be considered in pumps of both types is that of the "slip" or return of water through the valves. The efficiency of the pump depends largely on the efficiency of the valves as all slip is a direct loss of capacity and power. Spring control is usual, but direct positive action through mechanism is sometimes used and has proved of great advantage.

The original centrifugal pump contained impellers of crude design, being flat and rough, with large clearance and consequently high slip. In the modern centrifugal, the impeller is carefully designed to the proper curve, is made usually of some acid-resisting and hard metal, such as phosphor bronze, is machined so as to avoid loss of capacity through capillary action of the water, and works in conjunction with a chamber so that the direction of flow of the water is changed as gradually as possible, and the amount of eddy current set up is kept down to a minimum. Clearances have been reduced from one-sixteenth of an inch to one-thousandth. Air troubles do not arise with the centrifugal pump, but, on the other hand, it is not capable of picking up its own suction, and some means must be devised of charging it before beginning its operation. This is not difficult, but for cases where intermittent pumping is required, it may be a source of annoyance.

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Coal-Mining Machines for Iron Ore

Improvements in mining methods on the Mesabi range have not heretofore extended to the actual extraction of the ore underground. The miners still drill by hand, muck their own dirt and otherwise mine as they have done since the beginning. The number of miners on the range has not grown in proportion to the amount of development, and in consequence the production from underground mines has not been so large as it should be. How to increase the production, using the limited number of miners available, is therefore a question of vital interest. Could power machines be successfully used, it would necessarily mean a division of labor into two classes, miners and muckers, and the output per miner would be largely increased. The common laborers, becoming more proficient, would eventually graduate into the miners' class, thus increasing their number. With these ideas in view, it was decided to experiment with machines on the soft ores of this range.

An ordinary Sullivan air pick or coal puncher, and a Jeffries air auger were installed at the Harold mine, in the Hibbing district. The pick machine is the largest type manufactured by the Sullivan company, having a depth of undercut of 5½ ft. The bore of cylinder is 5⅛ in., the air pressure required 80 lb. and total weight 825 lb. To understand thoroughly the application of these machines to our mining methods, it may be well to mention first the several operations incident to taking out a set of ground by the ordinary top-slicing method. The miners first drill a round of holes in the breast, each hole approximately 5 ft. in depth and varying in number from three to five, depending upon the height of post, character of ground and whether drifting into the solid or with caved ground on one side. The upper holes are usually fired first and the bottom holes after the top dirt is mucked out. The amount of dynamite used depends upon the conditions mentioned above and varies from 15 to 30 ½-lb. sticks. After the upper holes are fired the miners secure the back by poling from the last set of timber into the breast. The ore broken in this blast is then loaded and trammed, and the bottom holes are fired. After all the ore is mucked out, the miners trim the breast, back and sides and the set is ready for timber. Under ordinary conditions the amount of time spent in these several operations is approximately as follows: Drilling, 17%; blasting, 4%; blowing smoke,

Note—Reprinted from a paper by H. E. Martin and W. J. Kaiser presented at the Minnesota meeting of the Lake Superior Mining Institute, August, 1913.

3%; tramming, 7%; trimming, 9%; timbering, 20%, and mucking, 40%.

The number of men required for one machine crew, is two machinemen, three miners and six muckers. This ratio was experimentally determined and is of the most importance to the efficient working of the machines, since there should be no delay from miners, muckers or machinemen waiting upon each other. The minimum number of working places or rooms required to take care of one machine has been found to be five, though a larger number will insure no delays and will make for higher efficiency.

The actual taking out of a set of ground with the aid of the machines is as follows: The set is first undercut with the puncher to a depth of 5 ft., the cut extending from the solid rib to within 6 in. or so of the open side, thus leaving a small pillar 6 in. wide for the full length of the set, its purpose being to support the ground against premature caving. Two holes are then drilled with the air auger, about 1 ft. from the solid rib and spaced about 2 and 6 ft. respectively from the back. In case the slice was driven into the solid, four holes would be necessary, two on each side. Two short holes are drilled by the miners in the small pillar. Boards are placed in the cut under the block to be broken out, a small amount of ore picked down upon them to hold them in place, and the holes loaded and fired. The advantage of placing boards beneath the ore before it is broken, while hard to estimate, is of considerable importance, as it gives a smooth surface from which to shovel. The miners now secure the back by poling and the room is ready for the muckers. After the ore is mucked out, the miners square up the set, place the timber and start another cycle of operations.

The average time for undercutting one set of ground, excluding delays, has been 59 min.; for moving from place to place and setting machine, 26 min. Drilling with the air auger has averaged 2.8 min. per ft.; time setting up, 1.4 min. per ft. These figures can and no doubt will be considerably improved as the machinemen become more proficient.

The advantages which can be claimed for the machine, aside from any direct reduction in the cost of producing the ore, are the employment of one-half common labor, the use of approximately one-half the amount of dynamite, the decreased liability of posts being blasted out and consequent caving of rooms, and the possession of a smooth shoveling surface. To the successful working of the machines, several conditions are essential. The rooms served by the machine must be easy of access from one to another, their height should not be less than 7 or 8 ft. and no bottom stoping should be necessary. In other words, the system can be applied to ordinary slicing and square-setting.

The results obtained so far have not been so satisfactory as could be wished, primarily because muckers were not obtainable in sufficient number to keep the machine and miners busy at all times. At the start many delays were occasioned by not having a sufficient number of places opened up for the machine. However, during the first five weeks of work, the average number of tons per man per day was 12, an amount considerably above the average for most places in our underground mines. Taking these points into consideration, it can be conservatively said, that it is not a question of what the machines can or will do, but merely one of organization, and their future on the Mesabi range seems assured.

Mineral Output of New York in 1912

The figures of mineral production by New York mines and quarries in 1912 as reported by D. H. Newland, Assistant State Geologist, are shown in the accompanying table, together with the corresponding information for 1911. The items are arranged in order of descending values in 1912. The mineral resources of the state were actively exploited, and the total value of the production amounted to $36,552,784, as compared with $31,730,747 in 1911, an increase of nearly 17 per cent.

Iron ore is the most valuable metallic mineral from an industrial standpoint. The gross output of this ore last year was 1,277,677 long tons; after allowance for concentration, this amounted to 1,057,702 tons of shipping ore, having a value of $3,349,895. There was a good advance among mines in the Clinton belt, though the magnetite ores as usual constituted the greater part of production. New developments have been in progress which may lead to a material advance in the industry in the near future.

The improved conditions in the building trades also brought about an increased output of quarry materials, inclusive of granite, limestone, marble, sandstone and trap, which had an aggregate value of $5,718,994, as compared with $5,560,335 for the previous year.

The production of carbon dioxide from natural sources was discontinued as the result of the recent action taken for the conservation of Saratoga mineral waters.

NEW YORK MINERAL OUTPUT, 1911 AND 1912

Product	1911	1912
Building brick, M	1,078,019	1,205,704
Pottery and clay products, including crude clay, value	$4,291,441	$5,076,537
Cement, bbl	3,691,373	4,783,535
Limestone, value	$3,174,161	$3,510,445
Iron ore, long tons	952,364	1,057,702
Sand and gravel, including sand-lime brick, value	$1,819,431	$2,683,465
Salt, bbl	10,082,656	10,502,214
Natural gas, M. cu.ft	5,127,571	6,564,659
Petroleum, bbl	955,314	782,661
Sandstone, value	$1,060,106	$1,280,743
Gypsum, tons	446,794	506,274
Mineral waters, gal	8,923,628	9,682,447
Talc, tons	65,000	61,619
Trap, value	$899,414	$483,863
Pyrite, long tons	53,453	58,137
Marble, value	$278,041	$241,847
Granite, value	$148,633	$202,096
Graphite, lb	2,510,000	2,628,000
Garnet, tons	4,285	4,112
Feldspar and quartz, tons	21,802	28,584
Emery, tons	769	589
Other materials[1], value	$380,054	$253,656

[1]Includes apatite, diatomaceous earth, marl, millstones, pigments, slate, and zinc ore.

A 13-Mile Bucket Tramway for the Saline Valley Salt Co. was completed late in June, and was built for the transportation of salt from the beds in Saline Valley to the railroad at Swansea in Inyo County, California. It was built by the Trenton Iron Works and it is said cost $500,000. The total length of the bucket line is 26 miles, and is made up of five sections, each working independently. It is electrically driven. An interesting feature of the construction is the use of the down pull on the west side of the mountain for the generation of 75 hp., which is used in aiding the pull of the load up the east side of the mountain. The bucket line in its travel reaches an elevation of 8700 ft. The rated capacity of the plant is 20 tons per hour, which can be increased by increasing the size of the cables. The Saline Valley company owns 1400 acres of land in Saline Valley in the northern part of Inyo County, east of the Inyo mountains. Salt has been mined here for the last 10 years, but transportation by mule team was too costly to permit the creation of a market for the product beyond the local demand. The tramway will deliver the salt at the railroad station, and should place the company in the position of a large competitor in the salt industry of California.

Wet Bucket Elevator Design

By Arthur O. Gates*

SYNOPSIS—An investigation of the mechanics of the wet-bucket elevator, a comparison of results with present practice, and suggestions for improvements. A close relation between belt speeds and pulley diameters is shown, and "critical speeds" at which best results are obtained has been determined. Effects of shape of bucket and of overspeeds are studied, several striking results are noted, and one or two radical suggestions are made as to shape of bucket and means of obtaining increased capacities.

The speed at which a wet-bucket elevator should be run, the proper slope for the ascending belt, the question of feeding into the boot or into the bucket, whether the dividing point in the receiver should be high or low, the right and wrong side for the extra rubber cover of the belt, and many other such problems enter into the design of wet-bucket elevators; problems which are all too often left to rule-of-thumb solutions. In studying the underlying theory of the wet-bucket elevator I have come to the conclusions that are here outlined.

Importance of Action of Head Pulley

What takes place at the head pulley where capacity is limited by several conditions is not well understood. It is known that centrifugal force helps the elevator to discharge, and that the force of gravity holds the pulp or liquid level in the bucket when going up and helps it out coming down; it is thought that friction perhaps slows up the discharge. Of the magnitude and relations of these forces our information is rather limited.

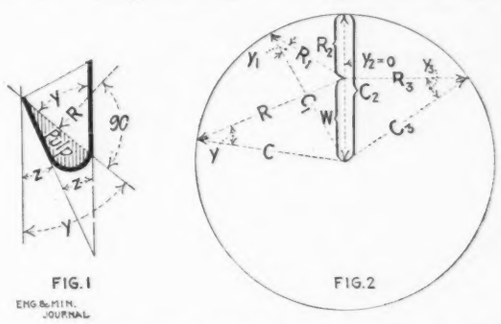
After the elevator bucket reaches the head pulley both the force of gravity and centrifugal force are acting on the pulp in the bucket, the former tending to hold it down in the bucket with its surface horizontal, the latter tending to pile it up against the discharge side of the bucket. As for friction, it will be found upon investigation that the velocity of the pulp with relation to the bucket, as well as the pressure between the pulp and the bucket, is low when they part company, and the distance passed over in contact is so short, that friction can be dismissed as having practically no effect on capacity or discharge.

The ordinary elevator bucket of malleable iron or pressed steel has a section about as shown in Fig. 1, the angle of inclination Z of the outer face being about 30°. The force of gravity acting on any particle in the bucket is the weight W of that particle, always constant and always acting downward. Centrifugal force C is always a radial from the center of the pulley, and its magnitude is determined by the formula,

$$C = \frac{Wv^2}{gr}$$

where C equals centrifugal force in lb.; W equals weight, or force of gravity in lb.; v equals velocity in feet per second; g equals 32.2, the acceleration of gravity; and r equals radius in feet, of path of particle.

The resultant R of these two forces C and W is constantly changing in magnitude and direction as the bucket carries the particle around the pulley. The level of the liquid is always at right angles to the resultant force acting upon it, and with a varying resultant, the surface will change with reference to the tangent of the pulley. The volume carried in the bucket will be limited by the sides of the bucket and, as shown in Fig. 1, a plane perpendicular to R. As the centrifugal forces on the particle at all points pass through a common center and are equal in magnitude, the two forces C and W are combined in the accompanying diagrams, about this center, the resultant R extending from the upper end of the vertical line representing the weight W, and ending at the circumference at a point corresponding to the angular position of the particle, the radial distance being equal to the centrifugal force C. The angle y, Fig. 1, between the surface of the pulp and the tangent to the circle of motion of the particle X is always equal to the angle y between the lines of the forces R and C (Fig. 2), each of the former being, respectively, perpendicular to each of the latter. From Fig. 1 it will be noted that as the angle y decreases, the volume of pulp possible in the bucket decreases, allowing the surplus to slip over the lip of the bucket and to be discharged; when y becomes equal to Z the bucket has no capacity whatever.



Forces Acting on Pulp in Elevator Buckets

From Fig. 2 it will be noted that R is least at the top position and greater at lower positions no matter what the relative magnitudes of C and W, that R tends to hold the pulp in the ascending bucket and discharge it from the descending. When C is less than W, R is downward at the top tending to empty the bucket onto the belt and to let it slop over the sides of the pulley. When C is greater than W, R is directly upward at the top position tending to push the pulp out of the bucket in that direction. When C is equal to W, R is equal to zero at the top position and the pulp is released from pressure against the bucket, and travels under the influence of the velocity it has, that of the bucket, and of the force of gravity. It is apparent that operation under this last condition will be near to that required for best results, the pulp will not fall onto the belt, the discharge will be free, and the buckets will have good capacity.

For this last condition, namely that centrifugal force be equal to the force of gravity, that is, $W = C = \frac{Wv^2}{gr}$ the velocities V in feet per minute, equal to 241 times the

*Purdue University, La Fayette, Ind.

square root of diameter in feet) of the bucket tip have been called "critical speeds," and the values have been plotted in Fig. 3 for different pulley diameters, speed and diameter being given in the form most advantageous in practice. It is here assumed that the pulp particles take the velocity of the bucket tip, which is substantially correct for the conditions which are being considered.

As the velocity of the belt and pulley is less than that of the bucket tip, additional curves have been drawn for the pulley diameters when belt thickness and bucket projection are allowed for. The curves give both the belt velocities and the revolutions per minute of the pulley for the different values of T (belt thickness plus bucket projection, in inches) of 3, 4½, 6, 7½, 9 and 12 in., when the bucket tip is traveling at the critical speed.

Many belt elevators in practice, operating at belt speeds from 300 to 400 ft. per min. will check fairly well with these curves; those at speeds above 400 ft. per min. are either running too fast or have pulleys too small for the belt speed. Present-day practice has been slowly and cautiously increasing velocities and pulley diameters, the curves show what changes can be made to increase capacity along rational lines.

In some plants elevators are reported running at 25 to 40% overspeed; critical speed equals 100%, and high hoods are required. This suggested a study of discharge points and of bucket capacities as affected by overspeeds, and the results as shown in Fig. 4 clearly indicate that these particular elevators were letting go of much if not all of their pulp just after the bucket reached the head pulley, probably recovering some of it to discharge nearer the receiver.

Effects of Overspeeds

In explanation of Fig. 4, it will be recalled that the resultant R of the two forces C and W is changing in magnitude and direction as the pulley revolves, and it is the direction of R that is of interest. At the critical speed a bucket traveling vertically, around the pulley, has its resultant R at 45° from the horizontal, which means that the pulp in the bucket assumes this angle on its surface. At overspeeds R is flatter, the pulp lies in the bucket at a steeper angle and capacity is less. As the bucket travels upward around the pulley the angle of R does not increase as rapidly as the pulley turns, so that up to a certain point its capacity increases, then it gradually decreases until discharged.

As before stated, the angle y is that between the surface of the pulp and the instantaneous direction in which it is moving. It varies, of course, with R, and its values are shown in Fig. 4 for the different angular positions as the bucket travels up to the top of the pulley, at the critical speed and at overspeeds. These y curves are found to be true circles passing through the center and top points of the critical-speed circle, and with centers at the intersections of lines drawn from these two points at angles y from the horizontal. The overspeed curves are lines of equal centrifugal force measured from the center of the circle. It will be noticed that the distance between them increases as overspeed increases, because centrifugal force increases as the square of the velocity.

Examples of Overspeed Effects

Using Fig. 4, what happens, say with 20% overspeed will now be explained. When the bucket reaches the head pulley the surface suddenly changes from a horizontal position to one inclined about 36° from the vertical, and likely the shock will throw some of the pulp up on a still steeper angle. As the pulley turns and the bucket reaches a point 20° from the horizontal the surface of the pulp has subsided to an angle inclined 40° from its direction of travel, half way up the surface angle is 43° and then it decreases to 40° at two-thirds up and then to 35° at 70° up the arc, then 29° at 75° up, and 22° at 80° up. Discharge has taken place when the surface of the pulp is parallel to the face of the bucket, that is, when y equals Z in Figs. 1 and 4. If Z is 30°, then discharge has taken place before the bucket is 75° up the arc. By the discharge taking place, is meant the point where pressure ceases between the pulp and the bucket and the pulp is free to leave, although it will be some little distance and time before they will actually have separated.

If a bucket with an angle Z equal to 25° have an overspeed of 40%, it will discharge all of its pulp at contact with the pulley, the belt rising vertically to the pulley, it will perhaps recover some of it at 15° up and discharge again 40° up the arc, and it holds nothing on an angle greater than 31°. The surface of the pulp may be

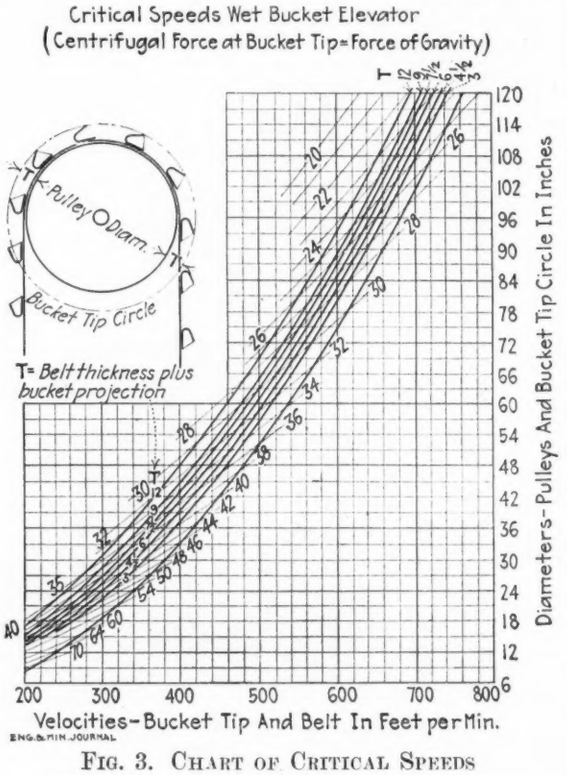

Critical Speeds Wet Bucket Elevator
(Centrifugal Force at Bucket Tip=Force of Gravity)
Pulley O Diam.
Bucket Tip Circle
T= Belt thickness plus bucket projection
Velocities-Bucket Tip And Belt In Feet per Min.
Diameters-Pulleys And Bucket Tip Circle In Inches
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Fig. 3. Chart of Critical Speeds

slightly curved and very likely as discharged will be elongated over the length of the face of the bucket. It does not seem that this would affect materially the point of division between the down-going buckets and the discharged pulp going into the receiver. I have been told that this point of division should be but little lower than the center line of the shaft, that it should be on a 45° angle from this, that it should be on a level with the bottom of the pulley, and again that it should be on a 45° angle tangent to the pulley. Two or three wet elevators that I have designed on the last basis discharged beautifully, but I am satisfied that the troubles of sampling-mill practice were responsible for this low discharge and

that in wet mills such extreme precautions are not needed.

In Fig. 5 are drawn various pulleys, with the paths followed by the pulp particles leaving the bucket tip at critical speeds plotted to the same scale; three curves are also drawn in dash lines showing paths followed when discharged 60° up the arc by overspeeds. Critical speeds of 7, 8, 9, 10 and 12 ft. per sec. have been taken, corresponding to pulleys 24, 33, 45, 57, 69 and 84 in. diameter, with belt and bucket projections 6, 7, 8, 9, 10½ and 12 in., respectively. The location of the discharging masses and also of the bucket tips are shown ¼, ⅜ and ½ sec. after leaving top position. The discharging mass is shown elongated partly to call attention to it, the shape of the mass is open to question. One who has listened to the discharge of an elevator knows that discharge takes place in masses rather than in a thin stream.

From these curves in Fig. 5, it can be seen that the divider placed on a horizontal line with the center of the pulley will make a good separation, provided the elevator be running up to critical speed. If below critical speed, the pulp which has fallen on the belt is discharged at the velocity of the belt and not of the bucket tip, and in consequence it does not start as high up nor go nearly so far out in discharging. As the coarser sand which may have settled in the bucket would naturally discharge last, the error is made on the safe side when the divider is placed lower. These observations on the position of the divider do not apply to so called dry ores, where a little moisture often requires a low divider.

The following conclusions can be drawn from what has been stated. The velocity of the bucket tip should not be less than the critical speeds given in Fig. 3, and not more than 5 to 10% greater. Overspeeds reduce bucket capacity and help discharge but little. In elevating water and nonsettling pulps, the outer face of the bucket should be nearly parallel with the belt face, as the capacity is in the lower front corner, and the slope of the outer face does not assist discharge. For pulp in which the sand may settle out it may be necessary to stick to the present type of bucket. With the change in bucket shapes suggested, about double carrying capacity per bucket could be obtained. Bucket capacities should be stated on the basis of a line drawn from the tip at an angle of 45° with the belt face, this being the maximum possible capacity for wet elevators running vertically. The diameter of the head pulley must be taken into account in every calculation, it is fully as important as belt speed. By increasing the diameter, the belt speed can be increased, giving greater capacity. Increased diameters will be easier on the belts. Unless the buckets finish loading after leaving the contact with the boot pulley, the latter should have the same diameter as the head pulley. The inclination of the ascending belts will allow the buckets to retain a greater portion of their load as they reach the head pulley. Discharge is not affected by inclination on the descending side. Capacity is proportional to belt speed, which can be greatly increased only by increasing the diameter of the head pulley. Bucket capacity can be greatly increased by making the section nearly rectangular. With decreased weight of bucket for equal capacity and with higher speeds, belt wear will be reduced, and narrower belts can be used.

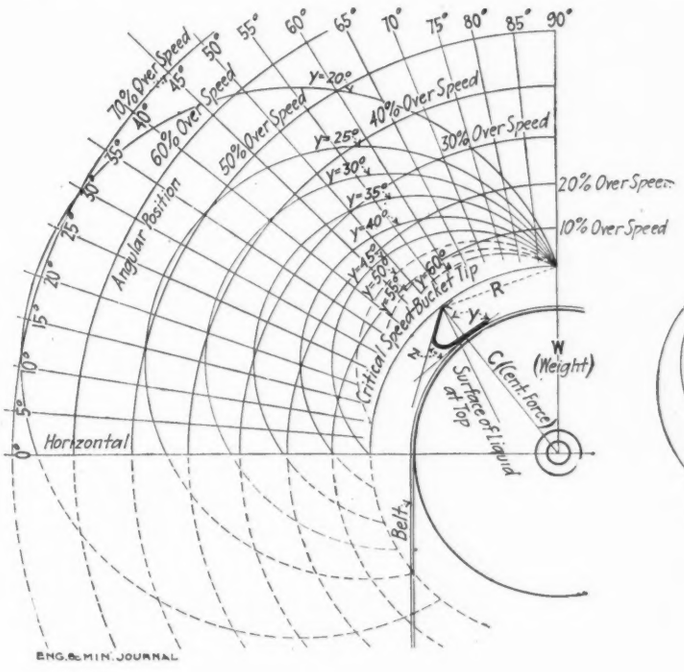

FIG. 4. FORCES ACTING ON CONTENTS OF BUCKETS ASCENDING HEAD PULLEY

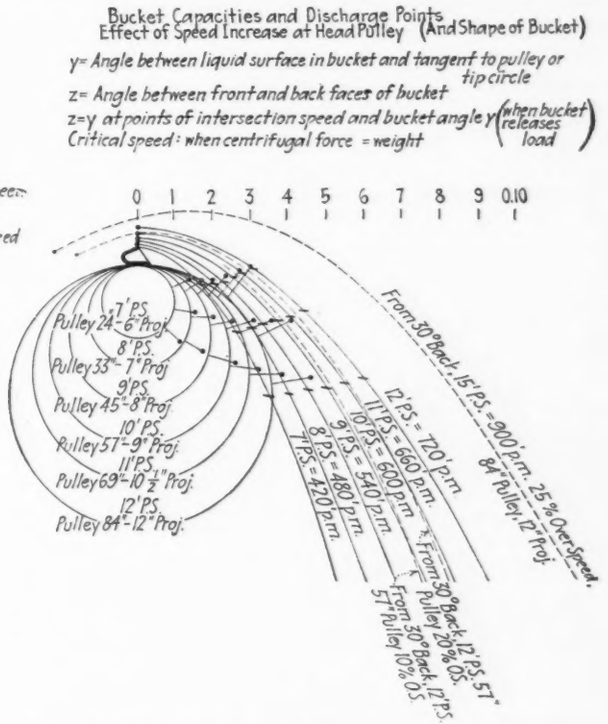
Bucket Capacities and Discharge Points
Effect of Speed Increase at Head Pulley (And Shape of Bucket)
y= Angle between liquid surface in bucket and tangent to pulley or tip circle
z= Angle between front and back faces of bucket
z=y at points of intersection speed and bucket angle y (when bucket releases load)
Critical speed: when centrifugal force = weight
From 30° Back, 15' P.S. = 900' p.m. 25% Over Speed. 84" Pulley, 12" Proj.
12' P.S. = 720' p.m.
11' P.S. = 660' p.m.
10' P.S. = 600' p.m.
9' P.S. = 540' p.m.
8' P.S. = 480' p.m.
7' P.S. = 420' p.m.
From 30° Back, 12' P.S. 57° Pulley 20% O.S.
From 30° Back, 12' P.S. 57° Pulley 10% O.S.
Pulley 24"-6" Proj.
Pulley 33"-7" Proj.
Pulley 45"-8" Proj.
Pulley 57"-9" Proj.
Pulley 69"-10½" Proj.
Pulley 84"-12" Proj.

FIG. 5. ILLUSTRATION OF EFFECTS OF CHANGING DISCHARGE CONDITIONS

Plugging the Engine is resorted to by Butte hoist men at the end of a trip. It consists of reversing the valve motion at the commencement of the retardation period, and keeping the throttles partly open, as well as the bypass. The effect is to retard the motion of the pistons with live steam which escapes to the other side of the piston and thence to the atmosphere through the exhaust valve. The quantity and pressure is regulated with the bypass valve. Such steam is wasted. But in the new installation of compressed-air hoists (A. I. M. E. Bulletin, September, 1913) a similar operation is performed with compressed air, which is restored to the compressed-air system, thus using the hoist temporarily as an air compressor.

The Nosciniscato Placers, Peru

The placers of the Nosciniscato River and tributaries are in the province of Quispicanchi, Department of Cuzco, Peru, and on the eastern slope of the Eastern Cordilleras, of which the principal snow-covered peaks rise to altitudes of over 20,000 feet. This country is reached from Mollendo on the Pacific Coast by journeying to Urcos on the Southern Ry., 502 miles from the port, thence half the remaining journey is made on mule back and half on foot.

Cuzco, the nearest important city, is 32 miles from Urcos and is the distributing point for the surrounding country, including the mines. From Urcos, the distance of 120 miles can be covered in a minimum of seven days' continuous travel. A fairly good mountain trail, 60 miles long, separates Urcos from Marcapata, 30 miles of very bad trail follows it to Cadena, and for the last 30 miles to the mine there is practically no sign of a trail. It is said, states Pierre Bouery in the *West Coast Leader,* that the placers were discovered by A. Hilfiker and sold to L. Gotuzzo, of Lima, who, without any knowledge of mining, spent $60,000 in expeditions, prospecting and taxes. Several expeditions were organized by him and his associates in the States, but only one reached the mines. This it did in 1909 and returned disgusted. The only work has been by natives, who during the dry season, pick out the best spots and, after weeks of work, come back with a few ounces of gold.

The bedrock is argillaceous schist. The Bonanza placer is 1½ miles from the mouth of the Huallumbe; it is over three miles long with a width ranging from 500 to 2500 ft. The depth of the gravel ranges from less than 1 ft. to a maximum of not over 7 or 8 feet.

The Huallumbe divides the gravel into two parts and exposes the bedrock or the thin layer of gravel above it. The grade of the river is about 1% toward the Nosciniscato, while nearer the source of the Huallumbe it reaches 5%. There the river has cut through the bedrock, making a deep cañon full of potholes. The bank cannot be worked by hydraulicking, because there is no grade for the sluice and there is practically no bank. From 2 to 7 ft. of bank means a continuous change of giants, elevators, or dredges, causing delays and expense which can only be compensated by a very high yield of gold. The costs of digging new sumps for elevators is prohibitive, as is also the moving of giants and the building of a retaining dam for raising the waterlevel to float a dredge.

The Quitari and the Yanaorco Rivers carry plenty of water all the year round, and with a ditch from 5 to 7 miles long will give a head of several hundred feet. Heavy floods during the rainy season would compel the use of expensive pipe lines, buried in the ground, to avoid breaks and delays. The size of the ditch should be sufficient to carry 3000 miner's inches, in order to overcome the lack of grade for carrying away the boulders and tailing. This amount of water will wash enough gravel to oblige frequent changes of the giants and elevators, and consequently the cleaning of all the uncovered bedrock, which would be a long and tedious operation. This could be partly overcome by washing at different places, but the equipment would then have to be more costly.

The first prospecting done by Bouery was near a small gulch. A dam was built between the banks and water was stored for rocking. Six pans were taken on each side of the bank and gave four fine colors. A second spot was selected along the river, and gave the same result in panning. A rich place was being sought as the natives customarily did but none was found. The crew of laborers was then divided into gangs, which for two days hunted for a place where the hose and water under pressure could be used to wash in the sluice-box a payable amount of gold. Finally at the end of the third day, in what is called the River of the Frenchman, the boxes were placed and the little stream dammed to get some pressure, because pan indications were very good, and it was thought that the right place had been found. The next morning work started and after 2½ cu.yd. had been washed, the boxes were cleaned. The contents were put in a bottle and panned until the last sign of black sand disappeared. On the scale the gold weighed 2.33 grams. Taking the gold at $20 per oz., on account of its exceptional fineness of 997, the value of the gravel was 59c. per cu.yd. It was a good prospect, but it could not be taken as an average of the deposit, because it was a concentrate on the border of the river, the bedrock showing about 5 ft. further and rising abruptly with less than 1 ft. of gravel on it.

Another spot was picked out in the same gulch, 250 ft. farther up, and after setting the sluices, the bank was attacked with picks and shovels. The contents of the boxes showed 11 fine colors, which were picked out and separated from the barren material. They were not weighed, but their value was estimated by comparison to be from 15 to 20c. for half a cubic yard. Cemented gravel was found, 50 to 150 ft. thick. Careful panning taken from place to place, especially near Quince Mil Soles, proved it to be barren, but only systematic panning and washing would be conclusive. All the creeks emptying into the Huallumbe cut through the cemented gravel. Pannings were taken from the bottom of the creek up to the surface every 5 ft., but not a color was found. The party then returned, deciding to leave the country to the native miners, who have time to spare for finding the rich pockets.

There is gold in the Nosiniscato, but as long as the country is unsettled, the trails and the roads unfinished, and the population as it is, there is no hope of seeing it dug out.

Chronology of Mining for September, 1913

Sept. 2—First of the new reverberatory furnaces of the Calumet & Arizona Mining Co.'s smelting plant at Douglas, Ariz., blown in.

Sept. 5—Smelting was discontinued at Teziutlan, Mexico, because of cutting off of fuel supply.

Sept. 13—The Strawberry tunnel, of the Strawberry irrigation project in Utah, was completed.

Sept. 15—Rio Tinto railway men went out on a strike.

Sept. 17—Miners employed in the coal mines near Bay City, Mich., went out on strike.—Coal miners in South Wales went out on strike because nonunionists were employed.

Sept. 20—Operators secure an injunction against picketing and parading by striking miners in the Michigan copper country.

Sept. 23—Coal miners in southern Colorado went out on strike.

Sept. 24—Robert Lee, camp marshall, was killed by striking coal miners near Segundo, Colo.

Sept. 25—Coal miners at Pontypridd, South Wales, returned to work.

Sept. 26—The Brown Mountain smelting plant, near Ouray, Colo., was blown in.

Sept. 29—Injunction prohibiting striking miners in the copper country of Michigan from picketing and parading dissolved.

Sept. 30—Disorder among the striking copper miners in Michigan again broke out.

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The Anaconda Company in Agriculture

The difficulties between the Anaconda Copper Mining Co. and the farmers of Deer Lodge Valley, who allege destruction of their agriculture by smelting smoke, is a matter of history and of a voluminous literature, especially in the records of the courts.

Not long ago the Anaconda company discovered, through the services of an experienced and distinguished agriculturist that the real trouble of farming in the Deer Lodge Valley was that the soil had become waterlogged. In addition to the natural waterflow, the Anaconda company has been for many years turning a great volume of water into the valley from the Washoe concentrator, while the native farmers, ignorant of the real conditions, turned in irrigation water, which was like piling Pelion upon Ossa. What was really needed was subsurface drainage, not irrigation. Since this was discovered by the Anaconda company, it has been demonstrating the remedy on its own lands.

FIELD DRAINED BY THE ANACONDA COMPANY, AND THE WATER FROM IT

An accompanying photograph shows a field of about 160 acres that has been thus drained. The picture shows the line of a ditch, just filled in, for an 18-in. concrete pipe crossing the field. This photograph shows the thriving appearance of the grass land. A second photograph shows the stream of water, issued from the 18-in. pipe, running down a ditch by the roadside. This is a vigorous brook. Where the water issued from the 18-in. pipe, the latter was about half full. It is rather weird to observe such a stream of water coming out of the ground without any apparent reason.

This is indeed a curious outcome of the Anaconda's smelting-smoke troubles. Incidentally it is interesting to report that the Anaconda company intends to make a scientific agricultural development of its extensive land holdings. The main idea of the management is to improve the living conditions of the employees, to render it possible for them to get out into the country and have little farms within reasonable proximity of the works.

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American Iron & Steel Institute

Final arrangements for the fall meeting of the American Iron and Steel Institute, to be held at Chicago, were made at the meeting of the board of directors at New York, Sept. 26. The dates of the Chicago meeting finally were determined as Oct. 24 and 25. The headquarters of the meeting will be announced shortly.

A list of the papers and discussions to be presented at the meeting is announced as follows: "Fuel Possibilities in Steel Melting," by William Whigham, assistant to president, Carnegie Steel Co., Pittsburgh; discussion, by W. G. Krantz, general manager, National Malleable Casting Co., Sharon, Penn.; "Developments in Treatment of Flue Dust," by Eugene B. Clark, vice-president and general manager, American Sintering Co., Chicago, Ill.; discussion, by John W. Dougherty, president, Pittsburgh Crucible Steel Co., Pittsburgh; "The Use of Refractories in the Iron and Steel Industry," by H. W. Croft, president, Harbison-Walker Refractories Co., Pittsburgh, discussion, by William C. Coffin, structural engineer, Jones & Laughlin Steel Co., Pittsburgh; "Extras—The Reason and Necessity Therefor," by J. L. Replogle, vice-president, Cambria Steel Co., Johnstown, Penn., discussion, by Henry P. Bope, first vice-president, Carnegie Steel Co., Pittsburgh; by John L. Haines, assistant to vice-president, Jones & Laughlin Steel Co., Pittsburgh; by Charles R. Robinson, general manager of sales, Lackawanna Steel Co., Buffalo, N. Y.; "Progress in Roll Design," by T. H. Mathias, assistant superintendent, Lackawanna Steel Co., Buffalo, N. Y., discussion, by Harry L. James, superintendent roll department, American Bridge Co., Pencoyd, Penn.; "Vocational Education," by Theodore W. Robinson, vice-president, Illinois Steel Co., Chicago, discussion, by Stephen W. Tener, manager accident and pension department, American Steel & Wire Co., Cleveland; "Steel Works Practice in the United States," by Thomas J. Bray, president, Republic Iron & Steel Co.; "The History and Problems of the Steel

Wheel," by John C. Neale, structural engineer, Carnegie Steel Co., Pittsburgh, discussion, by D. F. Crawford, general superintendent of motive power, Pennsylvania Lines West of Pittsburgh.

New Mine and Metallurgical Construction

Alaska-Juneau, Juneau, Alaska. The first unit of the mill is nearly completed.

International Smelting & Refining Co., 42 Broadway, New York, plans building a smelting plant at Miami, Ariz.

Y. P. Mining Co., Prescott, Ariz., has reconstructed the old plant of 10 stamps at the Cash mine, and has added five Wilfley tables and a Monell slimer for treating 20,000 tons of ore now lying on a dump.

Nacozari Consolidated Copper Co., Douglas, Ariz., is building a 100-ton concentrator.

Skidoo Mines Co., Skidoo, Calif., has completed the new 10-stamp mill that is to replace the 15-stamp mill, which was destroyed by fire last June.

Colburn Ajax Mill, Cripple Creek, Colo., proposes building an aërial tram from the Strong mine to the mill some time next spring.

North American Smelter & Mines Co., Denver, Colo. Pending an engineer's report, a mill will be built on the property of this company, probably near its smelting plant, at Golden, for treating ore from Clear Creek, Gilpin and Boulder County mines.

United States Gold Corporation, Boulder, Colo., is building 50-ton roasting furnaces, at its property.

Mount Champion Mining Co., Leadville, Colo., has been considering the building of a cyanide plant, but as yet no definite plans have been approved. In no case will work be started before the summer of 1914.

Red Bird Smelting Co., Clayton, Custer County, Idaho, has built a new smelting plant of 100 tons daily capacity; it was expected that the plant would be ready for blowing in about Oct. 1.

National Copper Mining Co., Wallace, Idaho, will build a 500-ton mill in such a way that it may be enlarged to 1500 tons daily capacity. The erection work is being done by contract by the General Engineering Co., of Salt Lake City. A flotation process will be used in connection with the usual gravity method.

White Fir Mine, Elk City, Idaho, will be equipped with a mill.

Flint Mines, Ltd., Flint, Idaho, is building a 100-ton stamp mill.

Dell Development Co., Aitkin, Minn., is building a new Jones furnace plant, for the treatment of manganiferous iron ore.

Dunglade & Co., Thoms Station, Mo., is building a concentrator.

Nilson Land, Carl Junction, Mo.—A. J. Shockley plans a mill for this property.

Isherwood, Carl Junction, Mo.—A concentrator is being planned for this property.

Lulu V., Spring City, Mo., has just completed a concentrator.

Cragg Mining Co., Joplin, Mo., is to build a 300-ton concentrator.

Gerster & Raines, Joplin, Mo., recently completed a 200-ton mill on the Red Lion lease.

Whirlwind Mining Co., Joplin, Mo., has made plans for a concentrator.

Athletic Mining Co., Webb City, Mo., will rebuild concentrator destroyed by fire Sept. 1.

Dexter & Co., Joplin, Mo., is building a 200-ton concentrator.

American Zinc, Lead & Smelting Co., Webb City, Mo., will build a new mill north of this city.

Barnes-King Development Co., Kendall, Mont., has recently completed the installation of 19 new tanks, with a capacity of 2425 tons, nearly doubling the capacity of the plant; it is expected that from 200 to 250 tons of ore will be milled in the near future.

Atlanta Consolidated Gold Mining Co., Atlanta, Nev., recently completed the installation of a new surface plant and headframe.

Consolidated Copper Mines Co., Ely, Nev., is planning reduction works for the treatment of ores from its mines in the Ely district.

Minnehaha Mining Co., East Rochester, Nev., is drawing up plans for a mill for the treatment of gold ore.

Nevada-Douglas Copper Co., Ludwig, Nev., will build a leaching plant for the treatment of copper ore.

Quartette Company, Searchlight, Nev., will rebuild the 40-stamp mill, destroyed by fire several weeks ago.

Coggins Mine, Salisbury, N. C.—A mill of ten 1000-lb. stamps is being erected at this mine.

Howie Mine, Waxhaw, N. C. The mill has been rebuilt and equipped for cyaniding.

Quapaw Mining Co., Miami, Okla., proposes building a mill.

O. J. McConnell, Miami, Okla., proposes building mills on the Never Sweat, Consolidated, Big Moose, Gish and two other properties.

Arthur H. Gruber, Milwaukee, Wis., will equip the Old Glory mines on Silver Creek, Ore., with complete, modern mining and milling equipment.

American Zinc & Chemical Co., Pittsburgh, Penn. A 400-ton zinc reduction plant is being built.

Oriole, Metaline, Wash.—A 25-ton concentrator is to be built at this mine.

Snowy Range Mining & Milling Co., Centennial, Wyo., plans building a mill for the treatment of gold ore next spring.

Mineral Production of India for 1912

The mineral production for British India is reported as follows by H. H. Hayden, director of the Geological Survey of India: Coal, 14,706,339 tons; gold, 590,555 oz.; petroleum, 249,083,518 gal.; manganese ore, 637,444 tons; salt, 1,454,602 tons; mica, 43,834 cwt.; saltpeter, 14,797 tons; lead ore and slag, 25,576 tons; tungsten ore, 1671 tons; ruby, sapphire and spinel, 323,245 carats; tin ore, 3493 tons, not including 4014 tons of block tin; iron ore, 580,029; monazite, 1135; copper ore, 9619; magnesite, 15,379; chromite, 2890 tons; alum, 5546 cwt.; steatite, 15,746; corundum, 8707 cwt. These items are arranged in order of descending values.

In addition to the above, other minerals and ores were produced, such as building materials, clay, garnet, gypsum, bauxite, diamonds, platinum, amber, etc., the value of which amounted to £363,738. The total value of the mineral output is estimated at £9,321,486, an increase of £1,340,318, or 16.8% over that of 1911.

Availability of Motor Trucks for Mines

SYNOPSIS—Compiled information on the performance of motor trucks in the mining industry. Results, as stated by various operators. The motor truck most available for incidental work close to the mine. Suitability for regular ore haulage not yet demonstrated. A résumé considers: Tires, repairs, fuel, roads, points in design, climate, altitude, first cost, interest and depreciation. Electric trucks possible under certain conditions. Trucks must be built better for hard mine service.

The invasion of the haulage field by the automobile and the threatened displacement of the draft horse, is an interesting recent phenomenon in our commercial development. As being of live interest and promising future development, the JOURNAL has collected data and information regarding the application of motor trucks to mining purposes. Most of this has been obtained by inquiry of the mining companies operating trucks. The motor truck in mining operations may serve two distinct purposes, namely, as a general convenience for handling supplies, etc., around the plant, running thus from mine to station, from mine to mill, from shaft to shaft, etc.; and as a regular means of ore or fuel transportation over greater or less distances, thus handling ore from mine to mill, or from mine to railroad, or concentrates from mill to railroad, or coal from railroad to mine, or some combination or variation of these duties. In the first case, the truck performs a great variety of functions, its work is irregular, and consequently no significant cost figures can be had. Its only competitor in this field is the horse-drawn wagon, and the truck may be said to have proved its superiority to the latter. In the second case, the work is systematic and capable of analysis on the cost sheets. The truck in such work competes not only with the animal-drawn freight wagon, but also with the surface tram, the aërial tram and the light railway. Its field is one which it was unsuccessfully attempted to cover some years ago with the gasoline or steam tractor of the type that hauls threshing outfits in the wheat-growing states. The success of the motor truck in this field is still undetermined.

TRUCKS USED FOR INCIDENTAL HAULAGE

To take up first the case of the truck used for incidental work, reports from various companies have been received. The Portland Gold Mining Co., in Victor, Colo., has had a Pierce-Arrow, 5-ton truck in use for nearly three years doing general haulage about the mine. Its principal work is carrying freight from the station to the mine or mill, a distance of about one-half mile, or supplies between mine and mill, a distance of about one-fourth mile. The roads are the ordinary mountain roads, in places reaching a grade of 25%. The cost of operating the truck averages about $300 per month, including $125 paid to the driver, $75 for gasoline and lubricant, and the balance for tires and repairs; interest and depreciation are not included. The truck will make on an average about 400 miles per month, and perform the work that would otherwise require two four-horse teams. Repairs have not been heavy, except for the tires, which have been more expensive by far than would be indicated by any guarantees. The service of the truck is stated to have been satisfactory. Evidently in cases like this, figures of cost per ton or per ton-mile are of no value. The work in country like that of the Cripple Creek district is about as difficult as would be met with anywhere in this class of service.

The Hazel Mining & Milling Co., of Van Horn, Tex., in a communication states that while definite figures are not available, the upkeep expense is too great to make its truck an economical investment. The truck is used to haul freight from the railroad, a distance of about 15 miles.

Witherbee, Sherman & Co., Inc., of Mineville, N. Y., have in operation two Federal trucks of 1½-ton capacity each. They are used for hauling general mine supplies, such as lumber, coal, drills, etc. Gasoline consumption is between 6 and 10 gal. per day. For one truck, covering a period from June 1 to Jan. 1, repairs and replacements cost $288.95, and labor cost $105.47. The country is mountainous, steep grades are encountered, and the roads are rough.

EXPERIENCE OF THE NORTH STAR MINE

The most detailed information covering truck service of this class comes from the North Star mine, of Grass Valley, Calif. A truck here has been in use for over five years. It is a Plymouth machine, purchased in May, 1908, for $2285, and has been in almost continuous operation since that time. The average annual mileage is probably 2500 and the loads vary between 1½ and 2 tons. Gasoline consumption will run one gallon per five miles; lubricant consumption, one quart per 200 miles. For 2½ years after November, 1910, in which time probably a mileage of 6300 was covered, the tire expense amounted to $750, equivalent to 12c. per mile. In June, 1912, 5-in. block tires were put on the rear wheels, and Diamond solid tires on the front; these tires are still in use. Previously, 3-in. block tires were used on the front wheels, and lasted only about 1000 miles. The tires in use at present seem to be doing better than 2000 miles. The principal repairs have been as follows: One year after purchase the body was rebuilt and the car changed from a friction to a gear drive; in 1912 the rear wheels collapsed and were patched in the mine shop; in the same year the cylinder cracked and was replaced for about $100; new gears, costing about $150, have also been installed. The cost of gasoline and lubricant is approximately 5c. per mile, with gasoline at its present price; tire expense is 12c. per mile, making a total of 17c.; repairs and depreciation probably increase this to a final total of 22 or 25c. per mile.

USE OF THE TRUCK FOR ORE AND FUEL HAULAGE

In systematic haulage operations, conducted over a given route, the motor truck enters upon a much larger field, and yet here its disabilities become more marked. Accounts of the experiences of several operators have already appeared in the JOURNAL.[1] Our inquiry has also elicited considerable additional data.

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[1] "Motor Truck Ore Haulage in Arizona," by C. L. Edholm, "Eng. and Min. Journ.," June 14, 1913.
"Motor Trucks for Mines," David Ross, "Eng. and Min. Journ.," Aug. 23, 1913.
"Motor Trucks for Mines," O. H. Sonne, "Eng. and Min. Journ.," Sept. 6, 1913.

The Miller Lake-O'Brien mine, at Gowganda, Ont., purchased a 5-ton truck, principally for transporting an old dump to the mill, and also a 1-ton machine for road building and odd jobs. The smaller truck became bogged on its way to the mine and had to be hauled by teams. Following this experience, the company intends to build a good road with a hard surface on which the trucks will operate.

The Mason Valley Mines Co. writes that its ore from the Anderson mine, which is situated about 4½ miles from Luning, Nev., is being transported by a contractor using a motor truck. The grade from the flat country to the property is between 8 and 10%. Much difficulty is encountered from the fact that the truck has a wider gage than the ordinary wagon, and, as it operates over wagon roads, heavy wear occurs on the sides of the tires. It is stated that if the road were properly constructed and used exclusively for the motor truck the service would be satisfactory.

The Santa Fé Gold & Copper Mining Co., of San Pedro, N. M., describes the performance of its La France truck in a letter to the manufacturers as follows:

> We have our truck in service between our smelting plant and our coal mine, a distance of approximately 16 miles. We make the round trip going empty and returning with six tons of coal, in approximately five hours. On the loaded trip we encounter one grade of over 8%, which is fully ¾ miles long. The truck takes this grade easily, without steaming the water in the radiator. For the last five miles before reaching the smelting plant, we have a continuous upgrade which in two or three places is over 20% for short distances of possibly 50 ft. We have hauled as much as seven tons up this grade and have never yet been stuck. Our gasoline consumption varies from 12 to 13 gal. per round trip. Our tires have stood up extremely well, and we have not yet replaced the original set.

The only cost given is the gasoline consumption. The actual mileage obtained from the tires is not stated; nor are depreciation, interest, repairs, wages, etc., mentioned.

Costs of the West End Consolidated

The following tabular presentation of the performance of the truck used for ore hauling by the West End Consolidated Mining Co., of Tonopah, is of considerable interest:

The cost data are rather more complete than usual, although a few points are not clear. The grade mentioned

PERFORMANCE OF PIERCE-ARROW FIVE-TON MOTOR TRUCK

Length of trip	1 mile round-trip.
Nature of load	Ore one way.
Weight of load	10,000 lb.
Weight of truck	8750 lb.
Maximum grade	8½%
Average grade	5%
Condition of road	Good macadam.
Trips per day	28.
Time of trip	15 min.
Time of loading	1 min.
Distillate consumption	2½ gallons per mile.
Altitude	6200 ft.
Oil consumption	1 pint per day.
Wages paid	Driver, $5 per day; helper $4 per day.
Hours of driver and helper	8 hours.
Monthly repair cost on truck	$80.
Monthly repair cost on road	$38.70.
Cost of hauling per month	$525 to $550.
Cost of hauling per ton	13½c.
Cost of supplies	Distillate 22½c. per gal. Lubricating oil 80c. per gal.
Tire expense	7c. per mile.

is against the load. Based on the figures furnished, the tonnage handled is 140 per day, or 4200 per month. Wages and repairs to trucks and roads amount to about 6.9c. per ton, the balance of the 13½c. being attributable apparently to fuel, lubricants and tires. The cost per ton-mile would be 27 cents.

This figure does not, so far as can be seen, allow for interest or depreciation. A short road in a town, such as this truck operates over, can, of course, be kept in good condition for much less money than can a long road, extending some distance from the mine.

Details from the Federal Lead Co.

A typical month's performance of an ore and coal-hauling truck of the Federal Lead Co., of Flat River, Mo., is given in the accompanying table. It goes into more detail than any other report received. The machine is a 4-ton Alco, and hauls coal to an outlying property of the company, making a return trip with concentrate. The property is about two miles from the railroad, and the intervening dirt road has been fixed up with rock and chats, until a fairly good surface and bed have been secured.

Conditions are favorable and the costs are probably as low as can be expected anywhere. It is to be noted that the coal handled is the determining load, but that the concentrate, by furnishing the partial return load, helps to reduce costs. No interest or depreciation are here included, and the expenditure on repairs for the month represented seems abnormally low.

Résumé of Results Reported

Study of the results here presented, as well as those previously published, makes it clear that the great question in motor-truck transportation is that of the tires. Second in importance is the question of repairs, and third is that of fuel consumption. Bound up with these three points are questions of road surface, road grade, altitude, climate, gear ratios, first cost, wages and various points of design.

Tires the Most Important Item

The tire question is the great stumbling block. A rubber tire on the average mining road simply will not stand up to its guarantee. The rubber block tire seems to be the worst of all. The attempt to substitute wood blocks for rubber blocks is rather an ingenious one, and seems to offer a partial solution. It is likely that in many cases, corrugated-steel tires, such as those used on traction engines, will prove most satisfactory. The cost of such tires per mile is, of course, low, and their tractive force in soft material is much greater than that of rubber. The power consumption and the jar on the machine are bound to increase, however, with their use. Such a tire has been applied to a truck used for logging (*Eng. News,* Vol. 69, p. 1065), apparently with success. In Grass Valley, the roads receive a good deal of care and have an excellent surface. Yet the reports of the North Star mine show that even with its light truck, the tire expense is enormous. Mr. Ross, describing his experience at the Pocahontas mine, states that tire expense, while high, is a fixed charge, so much per mile, since a set of tires, bought at a certain price, is guaranteed for a certain number of miles, 8000 to 10,000, usually. Probably Mr. Ross had an unusually good road surface over which to operate, for most of our correspondents report entirely different experiences. If, as Mr. Sonne, of the McConnell mines, says, a tire a week needs replacing, it is inconceivable that the tire manufacturer would sell more than one set covered by a 10,000-mile guarantee. In view of the rate at which some tires go, one truck might put out of business a tire company living up to and renewing its guarantee. In *Engineering*

Record, May 3, 1913, is noted a motor-truck haulage job across the California desert country, in which the statement is made that the tires in the soft desert sand lasted about three times as long as their guaranteed life; namely, 24,000 to 30,000 miles. It is small tribute to the intelligence of the manufacturers that they expect to address engineers and get away with such statements.

Repairs and Fuel Add to Costs

Repairs are evidently a source of tribulation and expense. Neither chassis or engine is built to stand up under the use it is bound to get. Springs break and other parts wear, and the resulting expense is not only the cost of the new part but the labor of changing it and the loss of time for the truck. This loss of time is also serious when tires are to be changed. With a $6000 truck hung up for a day, interest charges mount, and if insufficient storage capacity exists, demurrage charges on cars distillate or to a difference in the efficiency of the engines of the two makes of automobiles.

Roads and General Conditions Unsatisfactory

Unquestionably, the manufacturers and salesmen have no conception of the country in which the trucks must operate for mining purposes. Grades and surfaces of roads are worse than are likely to be encountered under any other conditions. To some extent, the roads can be improved, especially for short hauls, but to put in a well surfaced road with easy grades for a long distance in rough country means a first cost, comparable with that involved in installing a tramway or even a light railway. Sharp stones will cut the tires and either deep sand or mud and bogs will stall the truck entirely. The substitution of a truck for wagon haulage almost always means a new or an improved road. In some cases, in desert sands, a board track has been laid and in other

MOTOR-TRUCK PERFORMANCE ON PHOENIX-FLEMING LEASE OF FEDERAL LEAD CO.

MONTH OF APRIL.....1913.....

DATE	LABOR						SUPPLIES CONSUMED				COAL HAULED		CONCENTRATES HAULED			
	Driver, days	Helper, days	Loaders, etc., days	Repair	Road, days	Coal unload, days	Gasoline, gallons	Oil, gallons	Repair	Total miles	Loads	Tons	Motor Loads	Motor Pounds	Freight, tons hauled	Total tonnage hauled
1	1 1/10	1 1/10	3	..	..	..	17	1 1/4	.....	36	9	34	4	31,985	..	50
2	1 6/10	1 6/10	4	..	1	..	18	1 1/4	.....	36	9	34	3	22,545	..	45 1/4
3	1	1	3	..	1	..	19	1 1/4	.....	36	9	34	2	15,575	..	41 1/4
4	1	1	3	..	1	..	18	1 1/4	.....	36	9	35	2	18,665	..	44 1/4
5	1	1	2 5/10	..	..	..	19	1 1/4	.....	36	9	35	3	24,185	..	47
6	1	1	3	..	1	..	15	1 1/4	.....	32	8	31	2	16,260	..	39
7	1	1	3	..	1	..	13	1	.....	28	7	30	..	.....	..	30
8	1	1	1 5/10	..	..	..	..	..	..	..	..	..	..	.....	..	..
9	1	1	3	..	6/10	..	13	1	.....	20	5	18	2	16,080	..	26
10	1	1	3	..	1 6/10	..	13	1 1/4	.....	32	8	30	3	25,570	..	42 1/4
11	1	1	3	..	1	..	17	1 1/4	.....	32	8	30	5	40,270	..	50 1/4
12	1	1	3	..	1	..	18	1 1/4	.....	40	10	39	..	.....	..	39
13	1	1	3	..	1	..	16	1 1/4	.....	32	8	29	..	.....	..	29
14	1	1	3	..	1	..	16	1 1/4	.....	28	7	24	5	40,800	..	44 1/4
15	1	1	3	..	1	..	17	1	.....	28	7	27	1	6,915	..	30 1/4
16	1	1	3	..	..	..	17	1 1/4	.....	28	7	27	3	24,815	..	39 1/4
17	1	1	3	..	..	..	15	1 1/4	.....	32	8	30	2	15,455	..	37 1/4
18	1	1	3	..	..	..	17	1 1/4	.....	40	10	39	..	.....	..	39
19	1	1	3	..	1	..	15	1 1/4	.....	40	10	39	..	.....	..	39
20	..	..	..	..	..	..	..	..	..	..	..	..	..	.....	..	..
21	1	1	3	..	2	..	14	1	.....	28	7	27	..	.....	..	27
22	1	1	3	..	1	..	13	1	.....	24	5	20	..	.....	..	20
23	1	1	3	..	..	..	16	1 1/4	.....	32	8	31	3	21,650	..	41 1/4
24	1	1	3	..	1	..	17	1 1/4	.....	28	7	27	2	16,760	..	35 1/4
25	1	1	1 5/10	..	1	..	5	1/4	.....	8	2	7	1	7,945	..	11
26	1	1	3	..	1	..	16	1 1/4	.....	32	8	31	3	19,325	..	40 1/4
27	..	..	..	..	..	..	..	..	..	..	..	..	..	.....	..	..
28	1	1	3	..	1	..	16	1 1/4	.....	36	9	35	..	.....	..	35
29	1	1	3	..	1	..	15	1 1/4	.....	28	7	27	4	33,905	..	44
30	1	1	3	..	6/10	6/10	14	1 1/4	.....	32	8	31	5	39,850	15	66
Total	28 6/10	28 6/10	81 6/10	$0.90	21 6/10	6/10	419	31 1/2	$105.44	840	209	801	55	438,555	15	1035 1/4

Total Monthly Cost; Labor	$270.50
Supplies	197.12
Cost per mile	0.5567
Cost per ton hauled	0.4517
Cost per ton milled	0.0510
Cost per ton mile	0.2258

and delay in mine and mill operation will help to swell the expense account.

The cost of fuel in also a large item. Balanced, however, against the feed of animals used for hauling, it is surely cheaper per ton. It is noteworthy that in most cases fuel and feed prices go up and down together, geographically considered. Thus, in the remote mountain regions, gasoline and alfalfa are both high. This parallelism, however, does not always hold, and the differences in price might, in some cases, prove the determining factor in the choice of transportation methods. Distillate is used in many cases and probably will become increasingly popular. It is cheap and more compact, but is inconvenient. It costs on an average about half as much as gasoline and should give about 25% more power per gallon; but it is hard to explode and requires an auxiliary gasifier. The experience of the Calumet & Copper Creek Co., where gasoline proved cheaper per ton than distillate, may likely be due to a failure properly to use the cases brush and straw have been used to obtain a surface which would give sufficient traction for the wheels. The gear ratios need always to be changed from standard practice, to give a speed sufficiently low to overcome the steep grades.

The wages of the drivers are a large item in the monthly running expense, but are usually less per ton than for animal haulage. In this respect the advantage is easily with the truck.

Design Needs Modification

Many small points of the design require to be changed. The practice of sending out a truck with double rear tires, giving a wider gage than the wagon gage, is peculiarly exasperating. The result is, of course, that the outside rear tires are scraped off by the sides of the rut. It is hard to understand why this custom persists. Mr. Ross advises an equal distribution of load over both axles. We know of one large truck user in New York, who, after

tests, selected a Pierce-Arrow truck largely because the live load was all on the rear axle, and thus greatly increased the traction of the rear wheels. The result was that there was much less slippage and less spinning in tight places and consequently less wear on the rear tires. Radiator capacity is rarely sufficient and small consideration seems to be taken of the loss of power with altitude. All these points must be borne in mind and designs must be made to suit varying conditions. Altitudes will range from 0 to 10,000 ft., and temperatures from the extreme cold of Ontario to the great heat of the southwestern deserts.

First Cost, Interest and Depreciation

When the question of first cost is considered, the motor truck lies between animal haulage and a tramway. The first-class truck is the only kind worth buying, costing $5000 or $6000 for a 5-ton machine. With spare parts perhaps even with a spare engine, extra tires, improvements to the road and probably some new machines for the shop, the first cost may easily approximate $10,000. The daily capacity of such an installation is naturally a question of the length of haul. The fact of the truck's being a single large unit is, of course, a disadvantage. Suppose the question lay between four freight teams and one truck as being of equivalent capacity. The addition of one team, equivalent to 25%, would afford sufficient standby capacity, while for the truck an equivalent standby would require a 100% addition, that is, a complete truck.

It should be noted that none of the costs presented take any note of interest and depreciation except those of the North Star mine. This is a large item. When the $5000 truck goes to the scrap heap, a large sum will remain to be charged up against operations at some point. It must be said, however, that similar conditions exist in wagon freighting. Interest and depreciation are seldom charged in estimating such costs. As a matter of fact, there is no money in freighting. Most mines contract their freighting and the contractor either goes broke or sells out to a sucker. The reason is plain. He makes his price to cover feed and something more than wages, already having his equipment. In a year or two his wagons are gone and a horse or two has died and he has provided no sinking fund to replace them. Some motor-truck operators are likely to find themselves in similar straits in a few years.

It is noteworthy that all the trucks on which reports have been received are gas machines. No electric vehicles seem to have been installed. It would seem likely that in certain cases where fuel is high and electric power is cheap, that the electric truck should find a field. It lacks punch to get itself out of a hole and is not efficient if speed is required, but it will take steep grades, if given sufficient time, and it attains the limit in simplicity of operation.

Allowances Must Be Made for High Costs

The figures per ton, per mile and per ton-mile that we present look high, incomplete as they are, and auto-truck haulage would seem to be expensive. But all haulage is expensive; when ore is remote from the shipping or treating point, it will cost money to get it to that point. Furthermore, in considering the availability of the truck on the basis of these published costs, it must be remembered that it is a comparatively recent development. Higher efficiency will be obtained, as operators become better acquainted with the details of the work. It is necessary now to begin with a driver who is green in one respect or another. If he knows how to handle a truck, he will be ignorant of the country and the operating conditions. If he is acquainted with the roads and the regions, he will know nothing whatever about handling his truck. This is a condition which will remedy itself. These observations have been largely critical. Our desire is to present the facts just as they appear and point out the elements which could be changed. It is extremely likely that the motor truck will increase its field in mining. It is already accepted as a means of performing incidental work around the plant. Its success as an ore carrier is largely in the hands of the manufacturers.

We wish to express our thanks to the many mining companies who have put themselves to trouble to furnish us with the data we have published.

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Canada's Largest Power Station

Work has been started on the hydro-electric power station of the Cedar Rapids Manufacturing & Power Co., Montreal, Que., which, when completed, will be the largest in the Dominion of Canada, says *Power,* July 1, 1913. Its initial rating will be about 100,000 hp., and later on this will be increased to 160,000 hp. The site is at Cedar Rapids, in the St. Lawrence River, about 30 miles above Montreal.

The plant will be 663 ft. long and 130 ft. wide and will be built as a part of the dam. The intakes will be of the scroll or involute type. Generating equipment includes twelve 10,800-hp. waterwheels, which are to operate at 56 r.p.m. under a head of 30 ft., and will be the largest ever built. There will also be three 1500-hp. exciter units which will operate under the same head at 150 r.p.m. Twelve generators are to be connected to the waterwheels.

The turbines will be similar to those of the wheels for the plant of the Mississippi River Power Co., at Keokuk, Iowa. The chief difference is in arrangement for carrying the weight of the generator rotor and the moving parts of the turbine on a thrust bearing above the generator instead of below, as is done with the Keokuk turbines. The main units will be of the single-runner vertical-shaft type and will be installed in wheel chambers of spiral shape formed in the concrete foundations of the power house.

About 100,000 yd. of concrete work and 2,000,000 yd. of rock and earth excavating will be necessary. Contracts for 80,000 hp. of the output of this station have already been closed. Of this, the Aluminum Co. of America will take 60,000 hp. and the Montreal Light, Heat & Power Co. will take 20,000 hp. It is expected that the plant will be finished in October, 1914.

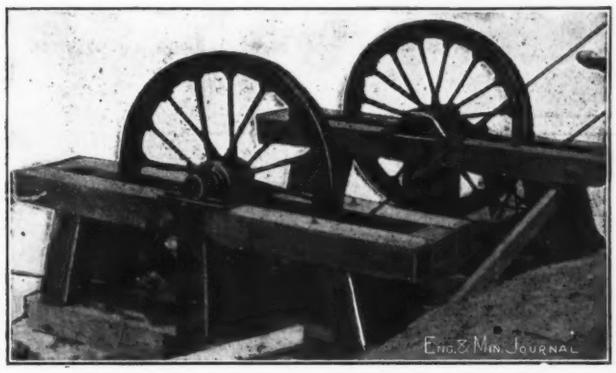
⁂

Of the Iron Mined in the United States in 1912, Minnesota produced 59.2%; Michigan, 19.3%; Alabama, 7.8%; New York, 2.1%. No other state mined over 1,000,000 tons. Four other states reported over 500,000 tons each—Wisconsin, Pennsylvania, Virginia and Tennessee, naming them in the order of their importance. Assuming all the iron mined to have been consumed the ore used to make one ton of pig iron in 1912 was 1.855 tons.

DETAILS OF PRACTICAL MINING

Holding-Down Sheaves

To control the direction of the hoisting cables from the Bonanza headframe to the hoist house, the Witherbee-Sherman company, at Mineville, employs the reverse sheaves shown in the accompanying illustration. They are similar in size and mounting to the ordinary sheaves on the headframe, but it is evident that the stresses on the bearings act in the opposite direction and that the supporting frame taken as a whole is under tension rather



Reverse Sheaves between Headframe and Hoist

than compression, requiring special attention to its anchoring. Note that a strap has been applied over one of the bearings.

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Efficiency of Butte Hoisting System

Soon after the installation of the new compressed-air hoisting system at the Anaconda mines, in Butte, a test was made to determine its efficiency ("Bull." A. I. M. E., September, 1913). The system includes a large storage capacity in receivers under a hydrostatic head. Practically all the air thus stored can be used without any important drop in pressure resulting. For the test the system was filled with air and the compressor stopped. The Mountain View hoist was then run for an hour with the stored energy from the receivers, and the drop of the water level in the tank which supplied the hydrostatic head was measured, thus giving the volume of the air consumed. The compressor was started and the air drawn during this time was restored. The electrical input for driving the compressors while restoring the air was measured. Indicator cards taken off the hoist during the run showed a low combined mechanical efficiency of the engine and the hoisting gear, due to the fact that the shaft was crooked, thus binding the skips. This mechanical efficiency was 69% from a depth of 1870 ft., and 67% from a depth of 1570 ft.

It was found that 327 hp. required on electrical input to the motor of 836 kw. Correcting this for the extra friction of the shaft as found by other tests at the High Ore and Speculator shafts, where the mechanical efficiency was about 80%, the input per shaft horsepower in a good shaft is about 2.04 kw., or 2.73 hp., giving a total efficiency of 36.37%.

While the air was reheated for this test and no note is taken of this in calculating efficiency, the heating was moderate, and, on the other hand, retardation on the end of the trips was effected by plugging the engine in the old way which wasted the compressed air employed, whereas in the system as operated, the hoists are used as compressors during the end of the trip to retard the skips and thus return a certain amount of energy to the system.

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Bulldozing Chute and Underswung Gate

By G. J. Jackson*

At the Perseverance mine of the Alaska Gastineau Mining Co., at Juneau, mining is conducted in large open stopes somewhat on the shrinkage system. Trouble was experienced from large rocks weighing several tons being

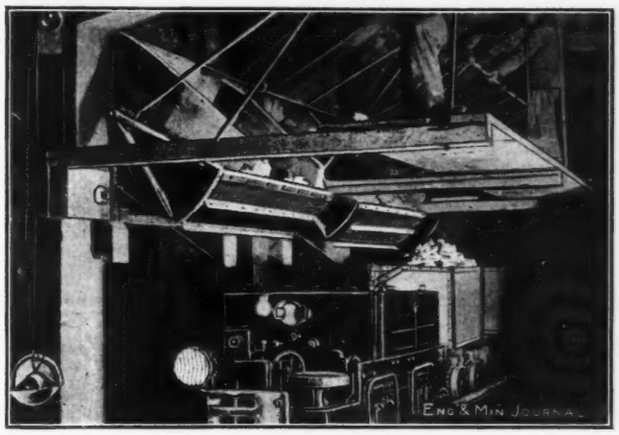

Fig. 1. Chutes, Gates, Platform and Train

drawn into the chutes; these rocks had to be blasted, with the result that chute timbers were often broken, and a continual expense in the upkeep of the chutes incurred. A chute with a special bulldozing chamber of my design, fitted with grizzly bars, was tried early in 1912. It proved a complete success, over 20,000 tons of rock being drawn through it without trouble. Fig. 2 is a section showing the general arrangement. The 80-lb. rails used for grizzly bars are spaced 2 ft. apart, one end resting in hitches cut in the foot wall and the other end on a 24x24-in. cap. Any rock passing through the grizzly can easily be handled in the cars; the larger rocks which remain on the bars are drilled with a small plugger machine and blasted. A ladderway, not shown, leads up to the bulldozing chamber from the level. When the ore is running freely, containing few large rocks, the grizzly

*Superintendent, Perseverance Mine, Alaska Gastineau Mining Co., Juneau, Alaska.

bars, over the back pocket, will be partly covered. Should the front grizzly block up, the small rock is got rid of into the back pocket, and the large rocks thus made accessible are blasted. The two pockets together hold about 25 tons.

The arc chute-gate shown in the photograph, Fig. 1, in side elevation in Fig. 2 and in front elevation in Fig. 3, is of the drop-down type. It is counterbalanced and is operated easily by one man by depressing the handle. It will handle any kind of rock and will shut off even with a 1-ton rock passing through. The operator stands on the platform above the cars, and is completely out of danger from rocks falling from the chute. In the old style of gate, men were constantly cut about the hands and head by falling material. A slide gate, not shown in the sketch, is used above the arc gate to check the rock.

The arc gate is made of ¼-in. iron plate, 18 in. wide and 6 ft. 6 in. long, bent with a 3-ft. radius. This is stiffened for its full length by three 2-in. angle irons riveted on. The two triangular end-pieces are made of ½x3-in. iron, reinforced by a piece of the same material fitted inside the arc. The two side levers are of ⅞-in. round iron, connected with a ⅞-in. iron handle, parallel with the gate. A $\frac{3}{16}$-in. wire rope attached to the end of each lever and passing over a small sheave wheel on the chute timbers, supports a weight sufficient to balance the gate. The gate is made in the mine shop and can be quickly set up on any chute, provided there is sufficient headroom to accommodate the operator.

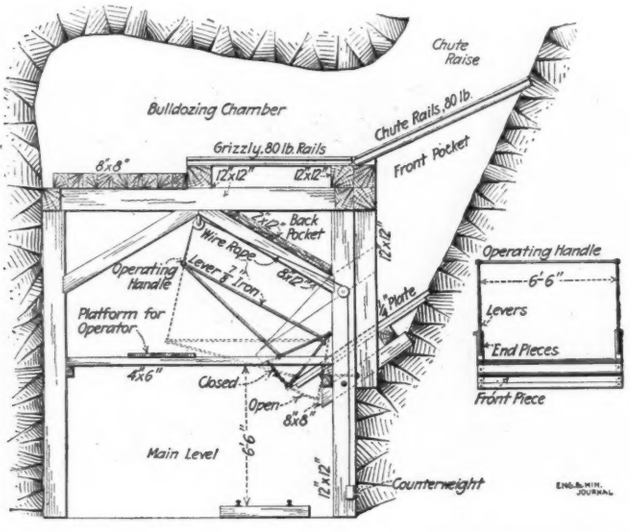

FIG. 2. POCKET, CHUTE AND GATE

FIG. 3. FRONT ELEVATION OF GATE

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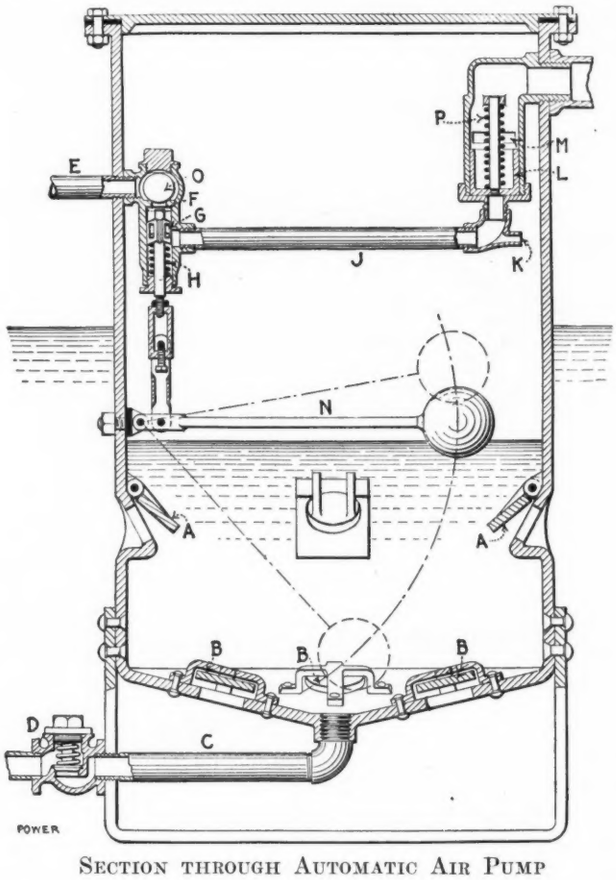
Accidents on the Mesabi Range result in damage suits which furnish much of the litigation occupying the courts. As a sequel to losing his hat in the Adams mine at Eveleth, one miner asks $20,643 indemnity from the Steel Corporation. The defendant claims that while in the act of recovering his hat his arm was caught between the side of the shaft and a cage, and he sustained permanent injury. Because he was furnished with a dull pick at the Schley mine near Gilbert, another miner was blinded in one eye by a flying fragment of rock. He has filed a suit against the Republic Iron & Steel Co. for $3000. Still another miner is suing the Rogers company for $25,000. He claims that while walking alongside the pit of the Iroquois mine at Mountain Iron, the bank caved in and he was precipitated to the bottom, resulting in paralysis. Injured by a landslide at the Spruce mine at Eveleth so seriously that he never will be able to leave his bed, he alleges, another man is seeking damages of $25,000 from the Steel Corporation.

Direct-Acting Compressed Air Pump

A mine pump using compressed air expansively, and with no piston, is shown in the accompanying illustration (*Power*, Aug. 19, 1913). The cycle of operations is as follows: Suppose the lower part of the chamber full of water, so that the float-and-lever device *N* is in the highest position. At this point the ball valve *O* is lifted off its seat *F* by the rod connection to the lever. This permits the compressed air to enter through the pipe *E*, passing through the valve *G* to the pipe *J* and thus through the outlet *K* to the upper part of the chamber. At the same time, it acts on the plunger *L*, which moves up in its casing and closes the ports *M* of the outlet valve. Air is admitted up to a point previously determined and



SECTION THROUGH AUTOMATIC AIR PUMP

adjustable. It is then shut off by the dropping of the float mechanism, which allows *O* to return to its seat. The expansion of the admitted air forces the contained water out through the pipe *C* until the pressure in the vessel is so reduced that the spring *P* can force down the plunger *L* and open the ports *M*. This permits the discharge of air and reduces the air pressure in the chamber to atmosphere. The pump being slightly submerged, the water then enters through the inlet valves *A* and *B*, fills the vessel to the previously determined point and the cycle is repeated. The connection between *N* and the inlet-valve mechanism is adjustable, thus making the cut-off point variable. The spring *H* keeps the plunger in contact with the ball valve *O* for a certain length of time. The check valve *D* prevents the return of the water from the column to the pump chamber.

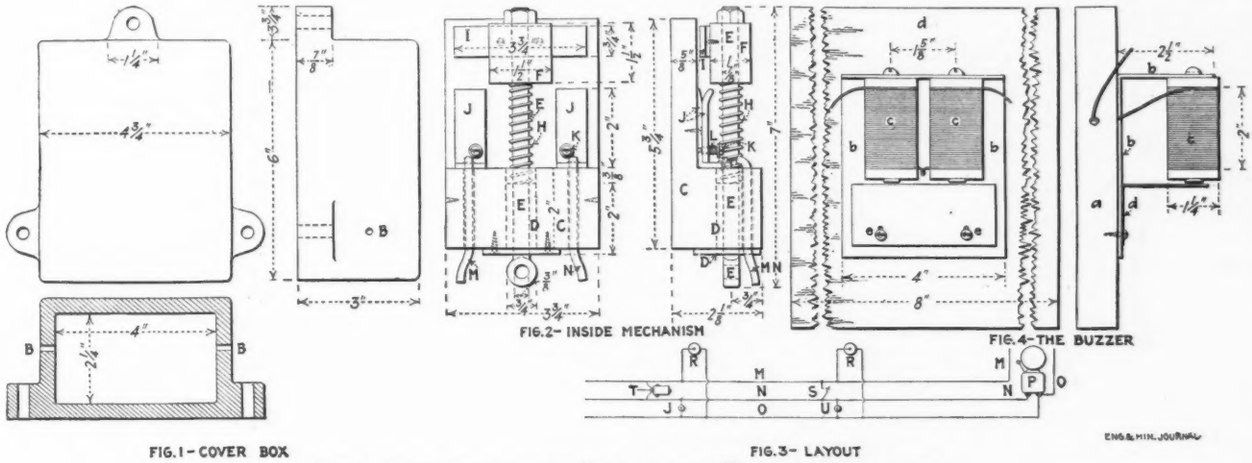
The pump is automatic, in that it will start as soon as

compressed air is admitted to the pipe line. It must, of course, work submerged, having no suction power; the submerged parts are made of noncorrosive metal. The pump was invented by Edwin Chamberlin and A. M. Gardner, of Avella, Penn., and is in use in the mine of the Pittsburgh & Southwestern Coal Co.

Evolution of an Electric Signal System

By George A. Packard*

The Raven mine at Butte was opened originally by prospectors and leasers, who very properly followed the vein on its dip with their shaft. Later operators continued this shaft and made so many changes in the angle of inclination that it became difficult to maintain and operate the ordinary type of bell-rope signal. Accordingly it was decided to install electric lights at the stations, using an alternating current of 110 volts, and at the same time to add a third wire and use an electric bell in the hoist room, the bell to be rung by a simple push-button at each station. This worked satisfactorily until the shaft entered wet ground, water then trickled down the wires and got into the push buttons, resulting in stray bells in the engine room, and confusion to the men hoisting in the shaft. A new management soon replaced the push buttons on the wet levels with "pull-boxes." This was developed from one in use at the Original mine, and in its present form is shown in Figs. 1 and 2. Changes were made to eliminate machine-shop labor and to remove the opportunity for stray bells as the box wore.



Pull-Box, Buzzer and Layout for Electric Signaling

It consists of a plain cast-iron cover, Fig. 1, open only at the bottom to receive the fittings shown in Fig. 2. The cover weighs nine pounds, and is heavy enough to stand the blow of any small rock falling down the shaft. It is fastened to the shaft timbers by long screws or spikes through holes in the three lugs, and has two holes *B* for holding by screws the wooden block *C*, which plugs the bottom and acts as a base for the fittings. This block is made small enough to allow for swelling; it is bored vertically ¾ in. from the front to admit the cylindrical portion of a mushroom-shaped casting *D* fastened to the block bottom with screws. This cylinder serves as a guide for a ⅜-in. eye-bolt *E*. On the upper forced up by the spring *H*. The spring is made from No. 12 wire; its bottom rests against the top of the casting *D* in a socket in *C*. To the back of the block *F* is screwed a strip of $\frac{1}{16}$-in. brass *I*, and at each side of *C* are fastened four similar strips *J*, the back two beveled back at the top, and the front two bent forward. The back strips are bent out at right angles at the bottom and the line wires *M* and *N* are connected, one on each side, by screws. The front brasses are held in place by the screw *K*, provided with a washer and a small coiled spring *L*, ¼ in. long. When the bolt *E* is pulled down, the brass *I* is forced between the two portions of the brasses *J*, making contact and, by connecting *M* and *N*, ringing the bell. The wires enter the box through two holes *C*, bored of such size that the insulation fits tightly, and so placed that there can be no possible contact with the screws at *B* or the casting *D*. Where there is much "copper water" this casting is of brass. To prevent *I* from being pulled down so far as to stick, two stops were subsequently screwed into the bottom part of *C*, between *E* and *J*, projecting about an inch above the lower end of this bolt a small wooden block *F* is held by the nut *G* which presses against the top of the box *A*, being part of *C*. These are not shown in the sketch. A cord through the eye of the bolt, ending in a porcelain knob, completes the device.

Later, another manager, finding that occasionally a man, ringing for air, say, on the 1100, had no way of knowing that another man was ringing to be hoisted from the 500 at the same moment, while the engineer could not determine what either was after, introduced a flash light into the circuit at each station. Fig. 3 shows the arrangement at this stage. Wires *M* and *O* are those in use for the lighting circuit. The wire *N* is added for the electric signal system, connecting with *P* the bell in the engine room. This bell is of the solenoid type, only one blow being struck each time the button is pushed. The station light is represented by *R*, and the push-button used on the dry level, by *S*. When pressed, *S* closes the circuit between *N*, otherwise dead, and *M*, and rings the bell. A pull-box is shown at *T* similarly placed on the lower levels. The signal lights on each station are represented by *U* connected between *N* and *O*, so as to glow only when *N* is live. These lights were only 10-watt lamps and the labor of connecting was small. The

*Mining engineer and metallurgist, Silver Bow Block, Butte, Mont.

scheme eliminated interfering signals and worked satisfactorily until an accident to a skip-tender showed that a simple flash light was not satisfactory, as it was a warning only when watched. Accordingly, a loud buzzer, obtained from the Anaconda company, was substituted, being connected into the water-proof lamp socket.

This buzzer, shown in Fig. 4 consists of a piece of board *a*, 8 in. square, to which is screwed a piece of No. 10 sheet iron *b*, 4 in. wide, and 7 in. long, the top 2½ in. being bent out at right angles to form a shelf. Beneath this are fastened two magnets *c* about 2 in. long, wound for 110 volts. These take about 450 ft. of No. 28 wire each. The vibrating member is a piece of No. 20 galvanized iron *d*, 3½ in. wide by 4 in. long, the top 2½ in. being bent over at right angles. This is fastened to the board through slots *e* so that the position may be adjusted, the horizontal portion being about $\frac{1}{16}$ in. below the coils. It is planned to vibrate with from 1½ to 2 amp. The whole is covered with a sheet-iron cover to keep it dry. The sound can readily be heard in the shaft 100 ft. away.

The installation of the buzzers led to some trouble with the electric bell in the engine room, as the coils here were wound for 4 amp., but as soon as these were replaced by smaller coils, this trouble was overcome. At the same time the buzzers were installed, a push button was placed in the line near the engineer's stand so that he could signal to the levels if desired. The possibility of return signaling in this manner is a most useful and important feature in a signal system which is too often neglected. It offers a means of avoiding mistakes and even accidents.

The wire used in the shaft was formerly No. 10 triple-braid weather-proof, but this was not satisfactory. It seems to give satisfaction where it has a chance to dry out between rains, but where constantly wet underground very soon begins to allow current to leak. The insulation also begins to come off under a constant drip, after several months' service. It was replaced by double-braid solid-okonite wire, and when the shaft was sunk double-braid rubber-covered wire was used. Both have been perfectly satisfactory. The wires are fastened to ordinary porcelain knobs on the hanging side of the manway, and no ducts of any sort are used to protect them.

The only part of the pull-box which cannot easily be made at any mine are the two castings. The total cost of the pull-box at Butte is about $5. The buzzers cost $3.15 each. The No. 12 triple-braid weather-proof wire cost $1.17 per 100 ft. when copper was selling at 17c. per lb., while the price of the okonite covered is $3.16 and the rubber covered $2.10.

As electric power is supplied to the mines from a substation connected with several generating plants the signal system is rarely out of commission. In a district where the power is liable to be cut off, an auxiliary storage battery would be desirable.

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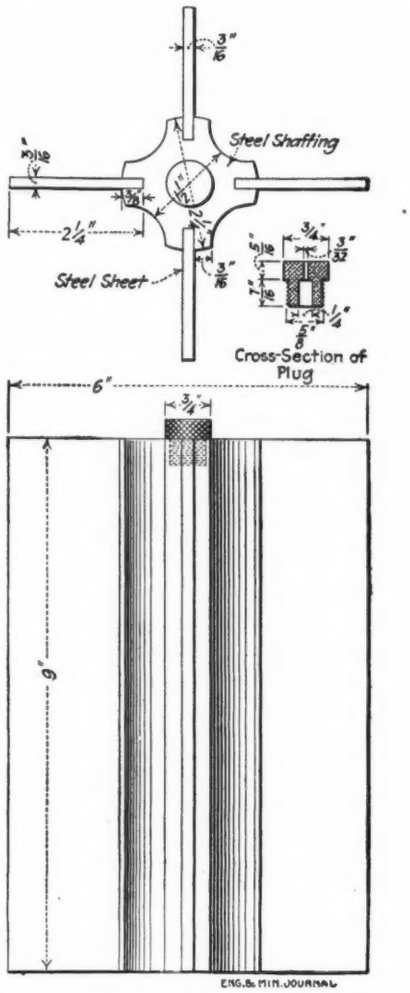
Slabs Are Constantly Falling from the Roof in drift mining the frozen gravels of the Fairbanks region, according to A. J. Katz, in Bulletin 525 of the U. S. Geological Survey. As the ceiling thaws in the stopes, sand and gravel fall in a continuous shower and pile up in mounds, partly filling the old workings. In some mines, where muck streaks are intercalated in the overhead gravels, large slabs spall off, gradually break away and fall. They come slowly so that they are not a source of grave danger to the men and therefore are not supported unless they threaten to bury the face. In this case pillars of unthawed material are left to hold the back until the face is brought well forward. When possible, these pillars are thawed and removed. Occasionally, the ceiling is supported with birch-pole cribs filled with waste gravel and boulders.

Plumb Bob for Shaft Plumbing

The bob shown in the accompanying illustration was designed for plumbing shafts of moderate depth. The broad wings retard both the swinging and the rotary motions, causing the bob to come quickly to rest. It is inexpensive, being made of steel scrap, and can be easily fashioned by a machinist. A piece of 2¼-in. shafting,



BOB WITH WINGS TO DAMP ROTATION

9 in. long, was machined into the shape shown in the plan. This was done to make the wing shape more pronounced and to lessen the weight for a given size. Four longitudinal slots, equally spaced, were cut in the shaft ⅜ in. deep and $\frac{3}{16}$ in. wide. Into these slots were driven pieces of $\frac{3}{16}$-in. sheet steel, 9 in. long by 2¼ in. wide, these pieces being fastened securely in place by turning in the edges of the slots with a calking tool. A ⅝-in. hole was bored in one end of the shaft and tapped. A plug, turned from a solid piece of brass, was threaded to fit the hole. As shown in the cross-section, a ¼-in. hole was bored partly through the plug, and a $\frac{3}{32}$-in. hole the rest of the way. This latter hole is sufficiently large to admit any size wire desirable. The weight of the plumb bob is about 11 lb. Two such bobs were used in plumbing the shaft of the Blue Jay mine of the Mason Valley Mines Co. The design is that of Robert J. Nesbitt, Thompson, Nev., master mechanic of the Mason Valley Mines Company.

THE COST OF DOING THINGS

Hollinger Costs

The 1912 report of the Hollinger Gold Mines, Porcupine, Ont., states that the year's work having been so badly deranged, statistical data in regard to costs would be meaningless. This was due to a strike of about one-half of the employees. The costs for February, 1913, covering 9250 tons, are given, from which the following tables were made up:

HOLLINGER MINING COSTS

Account	Cost per ton Ore Milled	Per Cent. Labor	Per Cent. Supplies
General mining charges	$0.053	75	25
Superintendence	0.126	100	..
Diamond drilling	0.027	65	35
Crosscutting	0.043	36	64
Drifting	0.338	60	40
Raising	0.007	66	34
Stoping	1.581	54	46
Timbering stopes	0.219	90	10
Track laying	0.013	58	42
Tramming and mucking	0.438	99	1
Pipe fitting underground	0.042	34	66
Mine drainage	0.050	28	72
Hoisting	0.170	54	46
Landing and dumping	0.063	100	..
Drill repairs	0.107	86	14
Drill sharpening	0.141	98	2
Distributing steel	0.050	100	..
Mine sampling	0.041	95	5
Assaying	0.017	47	53
Change house	0.008	100	..
Mine lighting	0.005	65	35
Handling explosives	0.025	98	2
Handling waste	0.016	100	..
Surveying	0.008	100	..
Total	$3.588	65.5%	34.5%

HOLLINGER MILLING COSTS

General mill charges	$0.160	75	25
Superintendence	0.075	100	..
Heating	0.076	55	45
Lighting	0.020	14	86
Watchman	0.009	100	..
Sampling	0.006	100	..
Assaying	0.033	48	52
Coarse crushing	0.073	61	39
Conveying	0.034	73	27
Stamping	0.181	47	53
Classification and tube milling[1]	0.277	19	81
Concentration	0.057	79	21
Handling concentrates	0.012	25	75
Grinding concentrates	0.036	48	52
Handling pulp	0.022	35	65
Thickening	0.012	82	18
Agitation	0.029	38	62
Filtration	0.147	67	33
Acid washing	0.013	77	23
Neutralizing	0.023	52	48
Classification and precipitation	0.074	15	85
Smelting and retorting	0.063	26	74
Pumping solutions	0.020	61	39
Cyanide	0.041	..	100
Alterations	0.200	52	48
Total	$1.693	49%	51%

[1]Includes cost of repairing and lining three tube mills.

TOTAL WORKING COSTS

	Per Ton Milled
Administration, management, insurance, etc.	$0.407
General charges	0.209
Clearing surface roads, etc.	0.015
Mining	3.588
Milling (not including alterations)	1.493
Operating camp	0.261
Loss on temporary boarding houses	0.042
Alterations to mill and plant	0.221
Strike expense	0.508
Total	$6.744

The costs are expected to be brought down to approximately $5.50 per ton under normal conditions. The wages paid range from $3.25 to $3.75 per day for skilled labor and from $2.50 to $3 for unskilled. Eight hours are worked in the mill and nine in the mine. Bed and board are furnished for 60c. per day.

Shaft Sinking in Minnesota Iron Mining

The data given herewith were extracted from Bulletin No. 1 of the Minnesota School of Mines. At the Harold mine, three miles from Hibbing, Minn., the thickness of the ore varies from 16 to 60 ft., averaging about 40 ft. In the 40-acre tract the tonnage indicated by drilling is estimated to be from four to five million tons. Approximately, two million tons have been developed. At Jan. 1, 1912, the development consisted of 3490 ft. of main level and an aggregate of 31,797 ft. for five sublevels, all connected to one main shaft. This mine was developed to the slicing stage in 14 months with a total of 38,220 manshifts. The average crew was 105 men, on two shifts. All construction work is included except steel headframe, which was built on contract. During the five-month development period to March, 1911, the following averages were obtained: 1.42 ft. advance and 5.83 tons per miner per shift, 1.05 ft. advance and 4.35 tons per man underground per shift, 0.72 ft. advance and 3 tons per man employed on the surface and underground per shift. During 10-month period of development and slicing ended Dec. 31, 1912, there was mined a total of 267,790 tons, 80% of which was slicing ore. The following averages were obtained: 2.07 ft. advance per miner on development work per shift, 10.03 tons of ore per miner slicing per shift, 6.58 tons of ore per shift per man employed underground, 4.99 tons of ore per shift per man employed on surface and underground.

It is stated that the cost of sinking a typical Mesabi shaft ranges from $50 to $100 per ft. This figure contemplates a shaft from 200 to 350 ft. deep with a certain amount of quicksand in thin layers, but no special difficulties. The water factor is variable and the maximum factor allows for a large volume. The following table may be considered as typical of the Hibbing and Chisholm districts.

		Cost per foot			Supplies analyzed per foot			
	Depth	Labor	Supplies	Total	Explosives	Timber	Steel-sets	Misc.
A	213	$29.99	$24.61	$54.60	$0.49	$10.00	.....	$14.12
B	253	46.03	56.74	82.60	3.32	14.00	$15.44	19.15

"A" shaft was sunk in orebody under normal conditions; very little water; depth a little under average.

"B" shaft sunk entirely in rock, 60 ft. being very hard sinking through seamed taconite. For 45 ft. above station tnis shaft is supported by steel sets. The timber cost is per foot of timbered section and steel cost per foot supported by steel.

In a chapter on shaft sinking an interesting table of costs at the Webb No. 3 shaft is given, from which the following table has been arranged. The pumping cost includes all pumping expense outside of boiler house. Wage for common labor was $2.10; miners, $2.75 to $3.25 per shift; fuel cost was $3.95 per ton. Labor conditions were fair until water was encountered, then good men were scarce. On the whole progress was satisfactory, water never getting the best of the men for more than a few hours. The table is divided into monthly periods beginning with August, 1910, and ended July, 1911. To understand the working conditions thoroughly a history of operations is given.

August, 1910—Sinking began Aug. 14, 1910. 40 ft. surface, consisting of clay, sand, boulders and hardpan; 7 ft. heavy broken taconite—all machine drilling—two 10-hr. shifts.

September, 1910—43 ft. heavy broken taconite—all machine drilling—two 10-hr. shifts.

October, 1910—65 ft. progress—conditions unchanged until end of month, when water was encountered.

November, 1910—20 ft. of rock. Conditions unchanged. Water grew to 500 gal. per min., and much time was taken to prepare for larger volume soon to be encountered, consequently there were about 20 shifts in which no sinking was attempted.

December, 1910—37.5 ft. From 195 to 205 ft., a few thin seams of paint rock were encountered. These gave a good deal more water and at 200 ft. the water was 800 to 900 gal. per min., requiring two Prescott sinkers at all times. There were three sinkers in the shaft and a No. 10 Cameron.

January, 1911—15.5 ft. of progress. No sinking was attempted until Jan. 9, on account of more preparations for handling water, because a 20-ft. layer of ore and broken taconite was reached. It was known that water would increase in this layer, which it did up to 1500 gal. per min. Three Prescott sinkers, 14x8x12, were in continuous operation during January and afterward.

February, 1911—Solid taconite was encountered at 233 ft., on Feb. 3, and three 8-hr. shifts were started on the 16th. A depth of 248 ft. was reached by Mar. 1, and sinking was stopped to cut station and do considerable drifting. Prescott compound pumps, 9x16x10x18, were then put in place on the bottom level, and from June to July 5, inclusive, solid-rock sinking went on to completion.

Webb No. 3 shaft. (Cost per foot)

Month	No. ft.	Boiler house expense	Pumping cost labor-supplies	Shaft labor	Shaft supplies	Steel sets	Total cost
Aug.	47	$2.767	$4.639	$10.98	$12.13	$14.73	$45.25
Sept.	43	3.077	3.332	30.60	20.11	14.73	71.86
Oct.	65	3.305	3.845	25.16	11.87	14.73	58.90
Nov.	20	17.082	16.384	90.19	41.83	14.73	180.22
Dec.	37.5	13.329	10.816	47.67	22.65	14.73	109.19
Jan.	15.5	95.064	41.987	91.09	41.14	14.73	284.02
Feb.	20	134.053	37.005	126.42	26.68	14.73	338.90
June	19	98.834	30.930	194.43	46.35	14.73	385.30
July	4	72.572	27.510	147.72	38.35	14.73	300.88
Total	271	$28.197	$12.668	$56.39	$22.50	$14.73	$134.49

The boiler house expense was made up of 85% fuel and 15% labor. Shaft supplies consisted of $4.17 per ft. for explosives; 37c. for candles and $17.96 for miscellaneous supplies.

The steel sets used in the Webb No. 3 shaft measured 6x18.75 ft. on the inside. The wall plates and end pieces are 5-in. H's, weighing 18.7 lb. per ft. The dividers are 10-in. I-beams. The sets are spaced 4 ft. center to center and held together with eight ¾-in. angle studdles; all angles are shop-riveted to the end pieces and dividers so that in a wet shaft less than two hours' time is required to put set in place. The shaft is lagged with Norway pine; the lagging is held in place by small 2½x2-in. angles, shop-riveted to the back of all wall plates and end pieces.

Recent Transvaal Costs

At the May Consolidated Gold Mining Co., Transvaal, South Africa, in the quarter ended Mar. 31, 1913, 43,590 tons of ore were milled at a cost of $3.69 per ton. The items were: Mining, hauling and pumping, $2.30; transporting ore, 9c.; sorting and crushing, 10c.; milling, 43c.; cyaniding sands, 25c.; cyaniding concentrates, 6c.; cyaniding slimes, 12c.; and general charges, 34c. The average yield of the ore was about $5.04 per ton. Of the ore mined 14.135% was discarded by hand sorting. The table given herewith is from the report of the General Mining & Finance Corporation for the quarter ended Mar. 31, 1913. The costs are based upon the tonnage milled. No allowance has been made for the government tax on profits.

RECENT WORKING COSTS— TRANSVAAL

Company	Aurora West United Gold Mining Co.	Cinderella Consolidated Gold Mines	Meyer & Charlton Gold Mining Company	New Goch Gold Mines	Roodepoort United Main Reef	Van Ryn Gold Mines Estate	West Rand Consolidated Mines
Mining	$2.75	$3.87	$2.09	$2.24	$2.75	$1.88	$3.61
Sorting, crushing and transporting	0.14	0.09	0.09	0.19	0.23	0.15	0.17
Milling	0.42	0.46	0.44	0.43	0.37	0.47	0.41
Cyaniding	0.45	0.41	0.54	0.34	0.35	0.37	0.42
General charges	0.42	0.67	0.60	0.31	0.41	0.31	0.52
Office expenses	0.09	0.18	0.45	0.10	0.11	0.14	0.19
Mine development and redemption	0.73	0.73	0.23	0.20	0.49	0.45	0.55
Permanent works	....	....	....	0.07	....	....	....
Total working cost	$5.00	$6.41	$4.44	$3.88	$4.71	$3.77	$5.87
Working profit	1.60	Loss	2.07	1.13	Loss	3.06	1.40
Revenue per ton of ore milled	$6.60	$6.40	$6.51	$5.01	$4.60	$6.83	$7.27
Tons of ore mined	52,079	64,458	44,214	97,489	96,575	123,962	109,610
Tons sorted out	9,980	9,328	2,480	16,579	17,656	8,922	23,410
Per cent. discarded by sorting	19.1%	14.3%	5.4%	17%	18.3%	7.2%	21.5%
Tons ore crushed at mill	41,699	55,170	42,014	81,160	78,891	116,000	86,300
Days running time	84.70	84.28	84.20	81.79	80.31	84.10	73.53
Tons per stamp per day	6.154	8.01	6.65	8.27	19.65	10.22	11.74
Stamps in operation	80	80–85	75	120	50	135	100
Tube mills operated	....	3	2	4	3	6	4

Stewart Mining Co.

The Stewart Mining Co. in the Cœur d'Alenes, Idaho, from June 30, 1912, to Dec. 31, 1912, mined 100,043 tons of ore, 2753 of which were shipped direct to smelters and the remainder treated at the mill. The total cost of production as reported was $3.68 per ton mined, made up as follows: Mining and development, $2.12; transportation of ore, 15c.; milling, 35c.; administration and general expenses, 31c.; taxes, 11c.; depreciation, 4c., and litigation and miscellaneous items, 57c. In addition to these charges about 11c. per ton was charged to capital accounts for improvements. The average yield of the ore was $5.91 per ton. Mining expense was made up of 60% labor and 40% supplies as shown; superintendence, etc., 4c. per ton mined; other labor, $1.25; candles, 1c.; explosives, 6c.; timber, 20c.; machinery and drill parts, 6c.; sundry supplies, including freight, 5c.; development, 36c.; total, $2.15 per ton. The milling expense was made up of 47% labor and 53% supplies, and consisted of the following items: Labor, 16.4c. per ton milled; machinery and parts, 3.2c.; lumber and timber, 0.4c.; sundries, 1.8c.; rent, 7.1c.; electric power, 2.3c.; heating expense, 0.6c.; sorting ore, 3.8c.; and care of flume, 0.1c.; total, 35.7c. per ton milled.

Historical Note on Zinc Smelting

The history of zinc metallurgy falls into two distinct lines—first, that of the metal, and second, that of zinc ore, for the latter was known and used to make brass by cementation with copper and to yield oxides by sublimation for medicinal purposes, nearly 2000 years before the metal became generally known and used in Europe.

There is some reason to believe that metallic zinc was known to the ancients, for bracelets made of it, found in the ruins of Cameros (prior to 500 B.C.), may have been of that age (Raoul Jagnaux, "Traité de Chimie Générale," 1887, II, 385); and, further, a passage in Strabo (63 B.C. —24 A.D.) is of much interest. He states: (XIII, I, 56) "There is found at Andeira a stone which, when burnt, becomes iron. It is then put into a furnace, together with some kind of earth, when it distills a mock silver (*pseudargyrum*), or with the addition of copper it becomes the compound called *orichalcum*. There is found a mock silver near Tismolu also." (Hamilton's Trans., II, p. 381). About the Christian era the terms *orichalcum* or *aurichalcum* undoubtedly refer to brass, but whether these terms as used by earlier Greek writers do not refer to bronze only, is a matter of considerable doubt. Beyond these slight references we are without information until the 16th century. If the metal was known to the ancients, it must have been locally, for by its greater adaptability to brass-making it would probably have supplanted the crude melting of copper with zinc minerals.

It appears that the metal may have beeen known in the Far East prior to such knowledge in Europe; metallic zinc was imported in considerable quantities from the East as early as the 16th and 17th centuries under such terms as *tutemque tuttanego calaëm* and *spianter*—the latter, of course, being the progenitor of our term spelter. The localities of Eastern production have never been adequately investigated. W. Hommel (ENG. AND MIN. JOURN., June 15, 1912) gives a very satisfactory review of the Eastern literature upon the subject, and considers that the origin of manufacture was in India, although the most of the 16th and 17th century product came from China. The earliest certain description seems to be some recipes for manufacture quoted by Praphulla Chandra Ray ("A History of Hindu Chemistry," London, 1902, p. 39), dating from the 11th to the 14th centuries. There does not appear to be any satisfactory description of the Chinese method until that of Sir George Staunton (*Journal Asiatique,* Paris, 1835, p. 141). We may add that spelter was produced in India by crude distillation of calamine in clay pots in the early part of the 19th century (Brooke, "Journ. Asiatic Soc. of Bengal," Vol. XIX, 1850, p. 212), and the remains of such smelting in Rajputana are supposed to be very ancient.

The discovery of zinc in Europe seems to have been quite independent of the East, but precisely where and when is clouded with much uncertainty. The *marchasita aurea* of Albertus Magnus has been called upon to serve as metallic zinc, but such belief requires a hypothesis based upon a great deal of assumption. Further, the statement is frequently made that zinc is mentioned in Basil Valentine's "Triumphant Chariot of Antimony" (the only one of the works attributed to this author which may date prior to the 17th century), but we have been unable to find any such reference. The first certain mention of metallic zinc is generally accredited to Paracelsus (1493-1541), who states ("Liber Mineralium" II): "Moreover there is another metal generally unknown called *zinken.* It is of peculiar nature and origin; many other metals adulterate it. It can be melted, for it is generated from three fluid principles; it is not malleable. Its color is different from other metals and does not resemble others in its growth. Its ultimate matter (*ultima materia*) is not to me yet fully known. It admits of no mixture and does not permit of the *fabricationes* of other metals. It stands alone entirely to itself." We do not believe that this book was published until after Agricola's works. Agricola introduced the following statements into his revised edition of "Bermannus" (p. 431), published in 1558: "It (a variety of pyrites) is almost the color of galena, but of entirely different components. From it there is made gold and silver, and a great quantity is dug in Reichenstein, which is in Silesia, as was recently reported to me. Much more is found at Raurici, which they call *zincum,* which species differs from pyrites, for the latter contains more silver than gold, the former only gold or hardly any silver." In "De Natura Fossilium" (p. 368): "For this *cadmia* is put, in the same way as quicksilver, in a suitable vessel so that the heat of the fire will cause it to sublime, and from it is made a black or brown or gray body which the alchemists call *cadmia sublimata.* This possesses corrosive properties to the highest degree. Cognate with this *cadmia* and pyrites is a compound which the Noricans and Rhetians call *zincum.*" We leave it to the readers to decide how near this comes to metallic zinc; in any event, he apparently did not recognize his *conterfei* from the furnaces as the same substance as the *zincum* from Silesia. The first correlation of these substances was apparently by Lohneys, in 1617, who says ("Vom Bergwerk," p. 83-84): "When the people in the smelting works are smelting, there is made under the furnace and in the cracks in the walls among the badly plastered stones, a metal which is called *zinc* or *counterfeht,* and when the wall is scraped it falls into a vessel placed to receive it. This metal greatly resembles tin, but it is harder and less malleable. . . . . The Alchemists have a great desire for this *zinc* or bismuth." That this metal originated from blende or calamine was not recognized until long after, and Libavis ("Alchymia," Frankfort, 1606), in describing specimens which came from the East, did not so identify it, this office being performed by Glauber, who says ("De Prosperitate Germanias," Amsterdam, 1656): "Zinc is a volatile mineral or half-ripe metal when it is extracted from its ore. It is more brilliant than tin and not so fusible or malleable . . . . . it turns (copper) into brass, as does *lapis calaminaris,* for indeed this stone is nothing but infusible zinc, and this zinc might be called a fusible *lapis calaminaris,* inasmuch as both of them partake of the same nature. . . . . It sublimates itself up into the cracks of the furnace, whereupon the smelters frequently break it out." The systematic distillation of zinc from calamine was not discovered in Europe until the 18th century. Henkel is generally accredited with the first statement to that effect. In a contribution published

Note—One of the footnotes from Hoover's translation of Agricola, Book IX.

as an Appendix to his other works, of which we have had access only to a French translation (*Pyritologie,* Paris, 1760, p. 494), he concludes that zinc is a half-metal of which the best ore is calamine, but believes it is always associated with lead, and mentions that an Englishman lately arrived from Bristol had seen it being obtained from calamine in his own country. He further mentions that it can be obtained by heating calamine and lead ore mixed with coal in a thick earthern vessel. The Bristol works were apparently those of John Champion, established about 1740. The art of distillation was probably learned in the East.

Definite information as to the zinc minerals goes back to but a little before the Christian Era, unless we accept nebular references to *aurichalcum* by the poets, or what is possibly zinc ore in the "earth" mentioned by Aristotle ("De Mirabilibus," 62): "Men say that the copper of the Mossynoeci is very brilliant and white, no tin being mixed with it; but there is a kind of earth there which is melted with it." This might quite well be an arsenical mineral. But whether we can accept the poets or Aristotle or the remark of Strabo given above, as sufficient evidence or not, there is no difficulty with the description of *cadmia* and *pompholyx* and *spodos* of Dioscorides (1st century). His *cadmia* is described as rising from the copper furnaces and clinging to the iron bars, but he continues: "*Cadmia* is also prepared by burning the stone called pyrites, which is found near Mt. Soloi in Cyprus. . . . . Some say that *cadmia* may also be found in stone quarries, but they are deceived by stones having a resemblance to *cadmia.*" *Pompholyx* and *spodos* are evidently furnace calamine. There can be no doubt that these materials, natural or artificial, were used to make brass, for he states (V. 46): "White *pompholyx* is made every time that the artificer in the working and perfecting of the copper sprinkles powdered *cadmia* upon it to make it more perfect, the soot arising from this . . . . . is *pomphalyx.*" Pliny is confused between the mineral *cadmia* and furnace *calamine,* and none of his statements are very direct on the subject of brass making. His most pointed statement is (XXXIV, 2): ". . . . . Next to Livian (copper) this kind best absorbs *cadmia,* and is almost as good as *aurichalcum* for making sesterces and double asses." As stated above, there can be little doubt that the *aurichalcum* of the Christian Era was brass, and further, we do know of brass sesterces of this period. Other Roman writers of this and later periods refer to earth used with copper for making brass. Apart from these evidences, however, there is the evidence of analyses of coins and objects, the earliest of which appears to be a large brass of the Cassia family of 20 B.C., analyzed by Phillips, who found 17.3% zinc ("Records of Mining and Metallurgy," London, 1857, p. 13). Numerous analyses of coins and other objects dating during the following century corroborate the general use of brass. Professor Gowland (Presidential Address, Inst. of Metals, 1912) rightly considers the Romans were the first to make brass, and at about the above period, for there appears to be no certainty of any earlier production. The first adequate technical description of brass making is in about 1200 A.D., being that of Theophilus, who describes ("Hendrie's Trans.," p. 307) calcining *calamina* and mixing it with finely divided copper in glowing crucibles. The process was repeated by adding more calamine and copper until the pots were full of molten metal. This method is repeatedly described with minor variations by Biringuccio, Agricola ("De Nat. Fos."), and others, down to the 18th century.

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Mr. Shaw's Statements

President Quincy A. Shaw, of the Calumet & Hecla Mining Co., has made positive denial of the various statements made Oct. 5, by J. A. Walker, president of the mining department of the American Federation of Labor, before the Boston Central Labor Union, descriptive of what Mr. Walker said were the "real conditions" in the Lake Superior copper region.

"I have no desire in any way," said Mr. Shaw, "to influence or attempt to influence public opinion on the labor controversy now existing. A full 80% of our men are at work and we have every hope of being able shortly to clear up the situation.

"When Mr. Walker states to a public assembly that my annual salary as president of the Calumet & Hecla Co. is in the neighborhood of $300,000 and that the salary of a vice-president is $85,000, it must be plain what impression he is endeavoring to create.

"In answer to that statement I say that my salary as president of the Calumet & Hecla is $15,000 a year, and that the salary of Mr. Agassiz, the first-vice president, is $12,000.

"Mr. Walker charges that the men have been working 11 hours a day under a contract system. The hours of work for the great majority I say are approximately nine, and for some time we have been trying to plan operations so an eight-hour day would be possible.

"The payrolls of the last full month of the Calumet & Hecla show that the miners were receiving an average wage of $3.66, and the trammers $2.89, after deductions for their medical assessment which entitled themselves and their families to medical treatment and medicines, and for the aid fund which pays benefits in cases of sickness and minor injuries. Both of these funds I might say are also supported in part by contributions from the company.

"In answer to his statement that 'trammers are a physical wreck after three years,' because, as he explained it, they have to push heavy ore cars along the rails, I can state without fear of contradiction that this is untrue. We have many trammers who have worked for us for years, and he also neglected to say that the ore cars which they push are on a down-grade to the shafts.

"One-man drill machines are not operated in isolated places. Such operations are only carried on where inspectors and workmen are at hand or frequently passing.

"In answer to his charge of stifling copper-dust-laden air, I would say the natural ventilation in the mines is so great that it is necessary to put in doors in the various levels to prevent too sweeping a draft. In answer to the charge that deaths and injuries are not reported because of their great number, I would say that under the law we make four reports of all such to different authorities. Inasmuch as a workmen's compensation act is now in effect in Michigan, the ridiculousness of this latter statement must be plain to all.

"The total number of men at work for the Calumet & Hecla company alone, exclusive of its smelters, is some-

thing over 3000. I think it approximately true to say that 1500 or more men are at work underground. These figures do not include men at work in the Osceola, Isle Royale, Superior, Quincy and Copper Range mines.

"The miners are law-abiding and peaceful men, and we have long been proud of their long service records with us, and the general spirit of friendliness which has existed. In Laurium and Calumet villages, with a population of close to 50,000 people, two marshals and two night watchmen have constituted the entire police force.

"This trouble has not come from our men, but from an element from outside which has attempted for its own purposes to take control of the labor field. We have with us hundreds of men who own their own houses, who are bringing up their families in a way creditable to the district and the country, and our relations with them even during this trouble have never changed. It is a business as well as a sentimental proposition that a contented working staff is the first requisite for real efficiency in any undertaking, and that is what we have always kept in mind in our relations with our employees."

The JOURNAL's readers will appreciate the humorous character of Mr. Walker's remarks about the trials of trammers and the suffering of the one-man drill runners who have to work in "stifling copper-dust-laden air."

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Discontinuance of Iron Bounties and Keen Foreign Competition has caused losses which have resulted in the Canada Iron Corporation deciding upon reorganizing its finances in order to reduce fixed charges. The corporation did a large business last year, but was unable to realize upon many of its accounts, mainly those due from municipalities. As a preliminary step the court at Montreal was asked to appoint a receiver to conduct affairs pending the reconstruction and F. F. Whyte, of New York, was appointed. The corporation has outstanding bonds to the amount of $4,637,933, and $7,741,300 stock, of which $2,909,000 is preferred. The properties of the corporation include iron mines at Eganville and Bessemer, Ont., Bathurst, N. B., and Torbrook, N. S., furnaces at Midland, Ont., and Radnor and Drummondville, Que., and foundries at Fort William, Hamilton, St. Thomas and Midland, Ont., Montreal and Three Rivers, Que., and Londonderry, N. S.

Landing Cableway at Nome, Alaska

The accompanying two views show in operation a cableway which is used to transport both passengers and freight from steamships to the shore at Nome, Alaska (*Eng. News,* Sept. 4, 1913). Fig. 2 shows a section of pipe being landed from a lighter, which in turn has been brought in from the steamer visible behind the pipe. The view was taken on June 22.

The cableway was built some years ago for the John J. Sesnon Co., of Nome, Alaska, by the Lidgerwood Manufacturing Co. The company at the time operated steamers from Seattle and San Francisco to Alaskan ports and owned warehouses and a wharf on the beach at Nome. The beach slopes gradually so the vessels have to lie several miles off at sea and land their passengers by small boats or lighters. In onshore winds the sea is rough and in the winter the waters freeze to the bottom for a long distance out. In order to provide a safe and continuously available method of landing, the company erected the cableway, part of which is shown in the views.

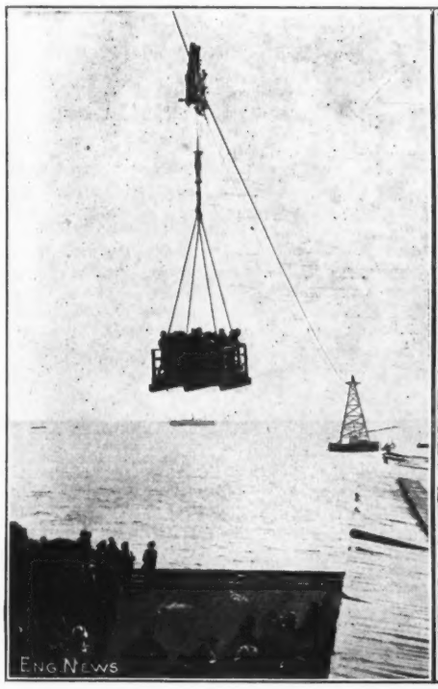


FIG. 1. LANDING PASSENGERS

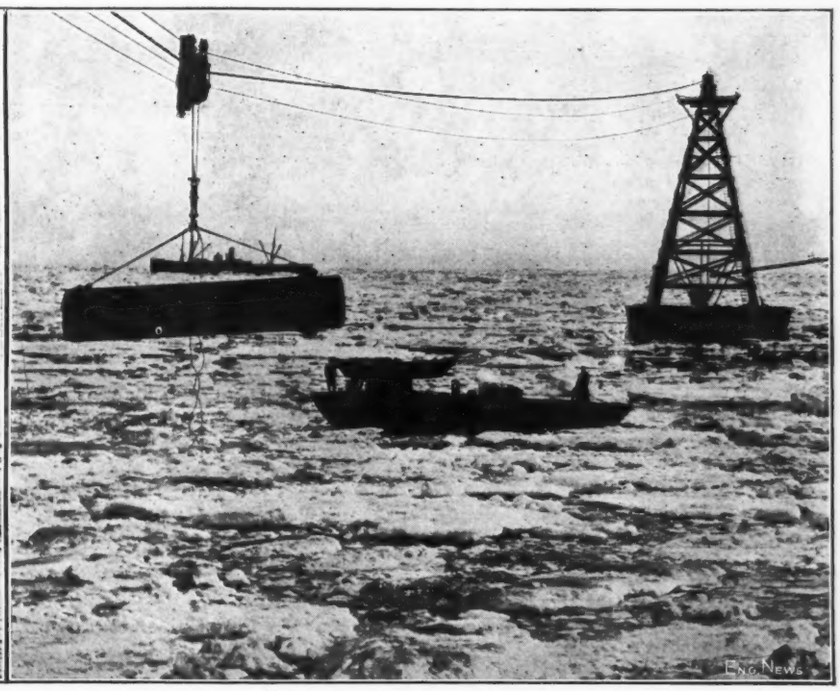


FIG. 2. LANDING PIPE AT NOME, ALASKA

This cableway spans between the sea tower illustrated and a shore tower not shown. The shore or head tower is 125 ft. high and the sea tower is 85 ft. high, the span between them being 1400 ft. A 2½-in. cable is used and the capacity of the cableway as designed is 10 tons.

The sea tower is built on a concrete base, which, in turn, is footed on timber piles driven in about 10 ft. of water. The concrete section is in plan a hollow square with the side toward the shore omitted. The off-shore face of the square is 48 ft. long and 10 ft. thick, with corners thickened up to 12 ft. The side faces are 46 ft. in length, 3 ft. thick and have corners 8 ft. square. The tower is of timber. The sills and posts are 12x12 in. in section, while the bracing is made of 3x12- and 4x12-in. timbers. The shore tower is of similar construction.

NEW PUBLICATIONS

THE GEOLOGY OF GOWGANDA MINING DIVISION. By W. H. Collins. 9¾x6½, pp. 131, illus., paper. Memoir No. 33, Canada Dept. of Mines, Geological Survey, Ottawa.

ECONOMIC MINERALS AND MINING INDUSTRIES OF CANADA. By the Staff of the Mines Branch. 6½x10, pp. 77, illus., paper. Canada Dept. of Mines, Mines Branch, Ottawa.

TRANSACTIONS OF THE AMERICAN INSTITUTE OF METALS. Vol. VI, 1912. Edited by W. M. Corse, Secretary. 6x9, pp. 250, illus. Published by the Institute, Buffalo, N. Y.

THE PRODUCTION OF PETROLEUM IN 1912. By David T. Day. Advance Chapter from Mineral Resources of the United States, 1912. Pp. 141. U. S. Geological Survey, Washington, D. C.

BRITISH COLUMBIA MINISTER OF MINES, ANNUAL REPORT FOR THE YEAR ENDING 31ST DECEMBER, 1912. 7¼x10, pp. 349, illus., paper. Richard McBride, Minister of Mines, Victoria, B. C.

THE TITANIFEROUS IRON ORES IN THE UNITED STATES: THEIR COMPOSITION AND ECONOMIC VALUE. By Joseph T. Singewald, Jr. Pp. 145, illus. Bull. 64, U. S. Bureau of Mines, Washington, D. C.

MAP OF THE STATE OF SONORA, MEXICO. 49¾x36⅜ in., drawn to a scale of one inch to 11.8 miles. Price $2 in folder for pocket use, or on rollers for hanging. Published by S. M. Greenidge, Mining Engineer, Douglas, Ariz.

L'EXECUTION ET LES EFFETS PENDANT L'ANNEE 1911 DE LA LOI DU 31 DECEMBRE 1909 FIXANT LA DUREE DE LA JOURNEE DE TRAVAIL DANS LES MINES. Rapport Présenté aux Chambres Législatives par M. Le Ministre de l'Industrie et du Travail. 8½x11, pp. 245, paper. Ministère de l'Industrie et du Travail, Administration des Mines, Brussels, Belgium.

SAFETY. By William H. Tolman, Ph.D., and Leonard B. Kendall. Pp. 422, illus.; $3. Harper & Brothers, New York and London, 1913.

This book is the only comprehensive work on safety that has yet appeared in the English language. Its sub-title "Methods for Preventing Occupational and Other Accidents and Disease" is adequately descriptive. Doctor Tolman, one of its authors, is well known as the director of the American Museum of Safety. He has been devoting his undivided attention to this subject for a great many years and consequently writes respecting it as an expert.

In their preface the authors say that their book proves that 50% of industrial accidents are preventable and cite the experience of the Pennsylvania R.R. Co., the Midvale Steel Works, and the United States Steel Corporation, which last year reduced their serious shop accidents by 63%, 61% and 45%, respectively. In their book they discuss the nature and causes of occupational accidents and show how they may be prevented.

The book is not only eminently practical, but also it is good reading. We have no hesitation in saying that every works manager ought to buy a copy and ought to read it. It would not be a bad idea for every mine manager to do likewise, although the book does not treat extensively of mining accidents pure and simple.

ELECTRICITY IN MINING. By Siemens Bros. Dynamo Works, Ltd. 7x11, pp. 196, illus. Charles Griffin & Co., London.

This is an excellent summary of all the common applications of electricity in mining practice. Some attention is given to electrical generation, distribution, transmission, switch gear, etc., and more detail is presented on the use of electricity for hoists, pumps, fans, compressors, haulage, drills, signaling, blasting, etc. The entire book is written in clear and intelligible technical language, if such an anomaly be possible. Published by a firm of electrical manufacturers, as the book is, the arguments are all, naturally, in favor of electrical installations, and some allowance must be made for exaggeration in favor of the application of energy in that form. The comparisons usually drawn are between electrical motors and steam engines, and no attention is paid to air engines, which are of considerable importance in this country, at least. In view of the increasing use of motors in mining practice, it may be that the statements made, while not strictly exact today, are truly prophetic. The best chapter in the book is that covering the various systems of electric hoisting, giving the advantages and fields of application of the various systems possible. The book cannot be taken as altogether authoritative, since in discussing the question of electric pumping on page 101 the statement is made that transmission by belt or gearing hardly comes into consideration. This is absurd, in view of the fact that electrically driven geared plunger pumps are probably now the accepted type in the United States.

WINDING ENGINES AND WINDING APPLIANCES. By George McCulloch and T. C. Futers. 5½x9, pp. 452, illus.; $6. Longmans, Green & Co., New York.

This is the most satisfactory treatise on the subject of mine hoisting that has yet appeared in the English language. It is equally excellent from the viewpoints of mechanics, mechanical engineering and mining, all three phases being kept constantly under consideration.

The introductory chapter sets forth the mechanics of the whole subject of hoisting, and by means of moment diagrams makes clear the influence of acceleration, inertia, speed and retardation, on the work to be performed by the engine. Chapters II to XII take up in order a number of typical designs, starting with a non-condensing, duplex-cylinder engine, with cylindrical drums and without tail-rope, and concluding with the most elaborate electrical systems for hoisting from great depths. In most cases, a certain definite problem is presented, with numerical assumptions of weights, resistances, speeds, safety factors, etc., from which the data affecting the design of the engine for the particular requirements are deduced. This makes the subject much more clear for most readers than the derivation of general formulas. By comparing one case with another, the effects of varying the assumptions of the general problem are clearly brought out. Conical drums, tapered ropes, flat ropes, and other means of equalizing engine work are discussed in detail. Results of actual tests are given.

Part IV, beginning with Chapter III, takes up the mechanical details of construction of hoisting engines, treating of cylinders and valve gears, of governors, pistons and rods, of drums, brakes, and clutches, of indicators and safety devices. The section on devices to prevent overwinding is especially valuable.

Chapter XVI covers the subject of hoisting ropes in a thoroughly practical manner, pointing out the advantages of certain ropes as compared with others for mine hoisting. Under the subject of safety catches for cages, only three types, all unknown in America, are illustrated. The application of one of these to cages running on steel guides is interesting. The subjects of skips and headframes are not covered very thoroughly. The methods described for decking cages at coal mines, and for transferring the cars to and from them, reflect the best European experience, and contain many novel ideas for American engineers, as does also the matter of rope guides.

GENERAL METALLURGY. By H. O. Hofman. 6x9, pp. 909, illus.; $6. McGraw-Hill Book Co., New York.

This is announced as the first volume of a series of five, the four others of which are to treat respectively of the metallurgy of copper, iron and steel, lead and the minor metals. Prof. Hofman has long been known as a teacher, original investigator and technical author. His early contributions to the "Transactions of the American Institute of Mining Engineers" showed him to be unusually gifted as a keen observer and clear expositor, characterized also by patience and industry in technical investigations. These qualifications were illustrated in his book on the "Metallurgy of Lead," which has run through five editions, and has recently received a ninth impression of the fifth. No doubt it will be enlarged and again revised to form one of the five volumes of the new magnum opus. An inspection of the general introductory volume now before me has given me an overwhelming sense of the labor and critical intelligence involved in its preparation. The author frankly acknowledges his obligations, and dedicates his book to Prof. Robert H. Richards, S.B., LL.D., "Teacher, Investigator, Friend"; and names also Prof. Joseph W. Richards of Lehigh University and several of his own colleagues in the faculty of the "Tech" as having given him important aid. But all that these eminent gentlemen have contributed amounts to little in comparison with the vast scope of this work, and the patient accumulation, careful sifting and logical arrangement of the voluminous material scattered through modern technical literature. Prof. Hofman naively confesses in his preface that "it has taken a great deal more time to write this book than was anticipated." The wonder is, that he has been able to write it at all, and that, having finished it, he has enough strength and courage left to promise that its successors will appear "at brief intervals."

As he justly observes, there is no other treatise on general metallurgy which meets present requirements. It is seven years since Babu's "Traité Théoretique et Practique" was left unfinished; 10 years since Schnabel's "Lehrbuch" brought the subject down to that date and 34 years since Bruno Kerl furnished a classic model in his introductory volume. Even the smallest of these periods covers a surprising variety of new discoveries and improvements. That Prof. Hofman has taken full account of these, not only his text, but his abundant foot-notes and bibliographical lists bear testimony. In more than 900 closely printed pages, with almost

an equal number of engravings, and 250 tables, he covers the physical and chemical properties of metals, alloys and metallic compounds, the various types of metallurgical processes, their ores, fluxes, apparatus and products, and, in greatest detail, the various fuels and refractory materials.

A glance at this list of subjects reveals at once how many of them have been so affected by modern progress as to require new treatment and arrangement. The chemical and physical properties of metals and alloys have been studied so fruitfully as to bring into existence a new science, with the microscope and the electric current as its tools. New processes in metallurgy have created new ores—that is, have enabled us to treat as ores low-grade materials not formerly entitled to that name. The mere increase in size of furnaces, their speed of running and degree of pressure and temperature, has revolutionized the rules of many metallurgical constructions and processes. Innumerable methods and devices have been introduced to meet the ever-growing demand for technical efficiency, the saving of labor and of other costs, and the abatement of injury to health or property. A new fuel—petroleum—has won a wide use, and the employment of gaseous fuel has been greatly extended and improved—latest of all is the employment of gas engines, and the manufacture and testing of refractory materials have been perfected to meet the severe requirements of higher temperatures and fiercer attacks involved in the new metallurgy.

It is a matter of no little difficulty to decide just what properly belongs to a treatise on general metallurgy, and what should be relegated to special treatises on the several metals. Professor Hofman has not only courageously met this difficulty; he has increased it by including hydrometallurgical and electrometallurgical processes and apparatus, and even the department of mechanical metallurgy covering crushing, ore-dressing, etc. No doubt, all these things may be regarded as logically embraced in general metallurgy; but Professor Hofman has been obliged to discuss some of them with unsatisfactory brevity. The only omission I have noted, however, in his outline is that of "flotation" under the head of ore-dressing. It is in dealing with refractories, furnaces and pyrometallurgical processes that he is naturally strongest, since it is in that department that he has most distinguished himself as investigator and instructor. On many other subjects, for instance, crushers and mills, he gives to his readers the advantage, which he has himself enjoyed, of the admirable testing-laboratory of the Massachusetts Institute of Technology, and, as I have already observed, he supplies to the student, with every chapter, through abundant bibliographical notes, the means of further research.

The list of creditable American technical books has grown with surprising rapidity during the last few years. It constitutes already a comprehensive library of applied science, and considering the contributions made to technical progress by American authors and practitioners, we may fairly say that this library is both a cause and a result of that progress. Certainly, no one of its constituent volumes better deserves a prominent and permanent place on its shelves than this great work, the students of which will ardently hope that its author may be enabled to carry out the greater work he has so brilliantly begun.

INTRODUCTION TO THE STUDY OF IGNEOUS ROCKS. By George Irving Finlay. 5x7½, pp. 228, illus., leather; $2. McGraw-Hill Book Co., New York.

It was perhaps a mistake to call this book an "Introduction," firstly because it presupposes a fairly complete knowledge of crystallography and of the use of the petrographic microscope, and secondly because one who has mastered the contents of the book can claim a rather intimate acquaintance with the igneous rocks. The author's experience of 15 years as a teacher of petrography is clearly reflected in the book; it deals with exactly those puzzling questions which are always coming up in the minds of students, and it clears them away in a most satisfying manner. The optical study of rocks is accentuated, the determination of hand specimens being reviewed in a single short chapter. This being the case, a chapter on the preparation of rock sections, and one on the manipulation of the petrographic microscope would have been in order, though the latter subject is referred to incidentally in the chapter on the "Movement of Light in Crystals."

The opening chapters are particularly clear in stating the relationship and points of contrast between the several great families of igneous rocks. Similarly, the distinguishing features of the relatively few essential minerals are presented with exceeding clearness; while the finer distinctions are treated in less detail; the discussion of the difficult recognition of the several types of feldspars is particularly valuable. Other minerals are treated in the same clear manner; in our judgment the book is characterized by its forcible presentation of broad distinctions.

The type rocks, 12 in number, are described in a chapter by themselves, followed by one covering the variations from the type rocks, in larger numbers. Excellent tables are presented at this point, serving to identify a rock by the preponderance or absence of stated minerals. Chapter VIII, on the method of describing rocks, introduces a profusion of elaborate technical terms, useful, of course, for abbreviating descriptions, but requiring that the reader of the description shall hold the cipher. The final chapter is an exposition of the quantitative classification, outlining the purpose and plan of the originators of the scheme, and indicating, by means of a few selected examples, the method of computing and assigning a given rock to its rightful niche in the edifice. Tables of molecular weights of the common rock constituents are grouped at the back, to expedite the calculations. Finally come two tables presenting the distinguishing optical features of the essential and of the accessory rock minerals.

The book is copiously illustrated with diagrams and micro-photographs, and is conveniently bound for pocket carrying. It is a practical handbook for petrographic students rather than a treatise on petrology.

ZINK UND CADMIUM. By R. G. Max Liebig. Pp. 598, illus.; 30 marks. Otto Spamer, Leipzig.

This new work rounds out a series of treatises on the metallurgy of zinc, of which the first was Ingalls' in English, and the next Lodin's in French. Nor should we forget the leading section of Prost's general metallurgy, which is a rich treatment of this subject. Thus we have had since the beginning of this century an exposition of the art of zinc smelting from the American, French, Belgian and finally the German standpoints. This is doing well for a branch of metallurgy, which only a few years ago was criticized for the deficiency of its literature.

The new book comes from highly competent hands. Herr Liebig, who is a retired works manager, was for many years the director of the famous Grillo smeltery at Hamborn (Rheinland). Through the relations of the management of that plant with certain American zinc-smelting interests Herr Liebig enjoyed unusual facilities of acquainting himself with foreign practice and of obtaining experience in the smelting of a wide variety of ore. Throughout his works career he must always have been a deep student as appears from the evidence of the present book.

Comparisons are always odious. We shall not pronounce it either the superior or inferior of Lodin's great work. They are both comprehensive treatments of their subject, although neither is exhaustive. Herr Liebig's is of course the most up-to-date of anything.

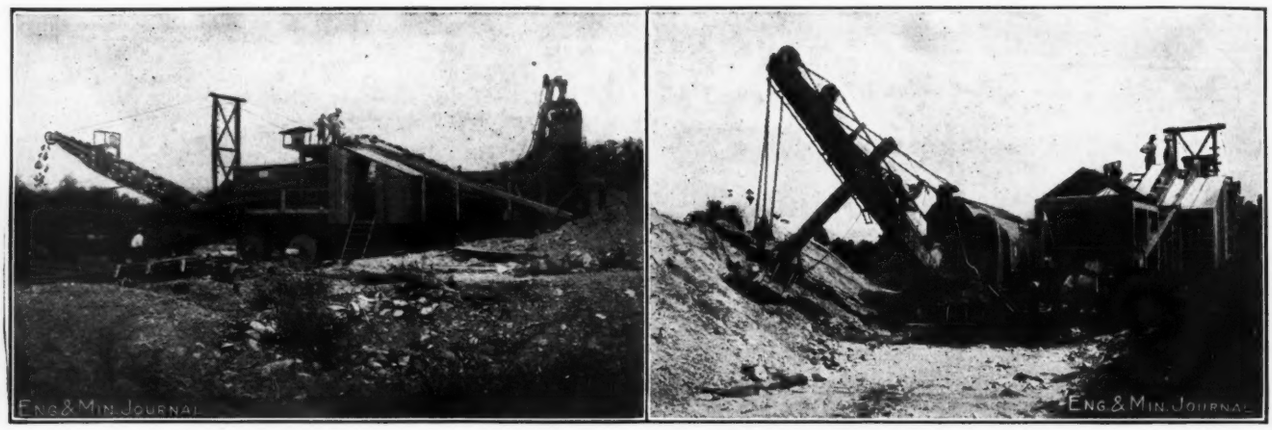
Herr Liebig has gone extensively into the history of the art. He says in his preface that he has done this because a full understanding of the development of a technical art cannot be possessed without a knowledge of the steps that contributed to progress. In this we agree with him. Possibly he has overdone the historical features in his book, but anyway he is ever interesting in them and we marvel at the minuteness of his knowledge.

In his technical pages he gives us descriptions and discussions of all the important methods, machinery and furnaces of European practice, richly illustrated with drawings and freely disclosing figures of costs, results, etc. This is, of course, the most valuable part of the book, and with respect to it we cannot exaggerate our appreciation of it.

Having thus expressed the high measure of our approval, we may be more critical with respect to the last section of the book, which relates to the methods and proposals for the extraction of zinc by methods other than distillation in retorts. Such a section of such a treatise is necessarily a compilation of reports recorded in the literature. The author may, however, be expected to exercise discrimination with regard to them and no doubt usually tried to. Herr Liebig has given us a wealth of valuable information in these pages and clearly has aimed to be discriminating. However, he has not always succeeded. This is, of course, largely the fault of the editors of technical journals and of technical societies, who allow things to be enrolled in literature that ought not to be. We will go further and say that it is also the fault of the profession who allow erroneous or misleading statements to go without correction and live to be embodied finally in permanent literature. Herr Liebig has suffered in this way along with other authors. His treatment of the matter of electric smelting, for example, is wholly inadequate and imperfect in conception.

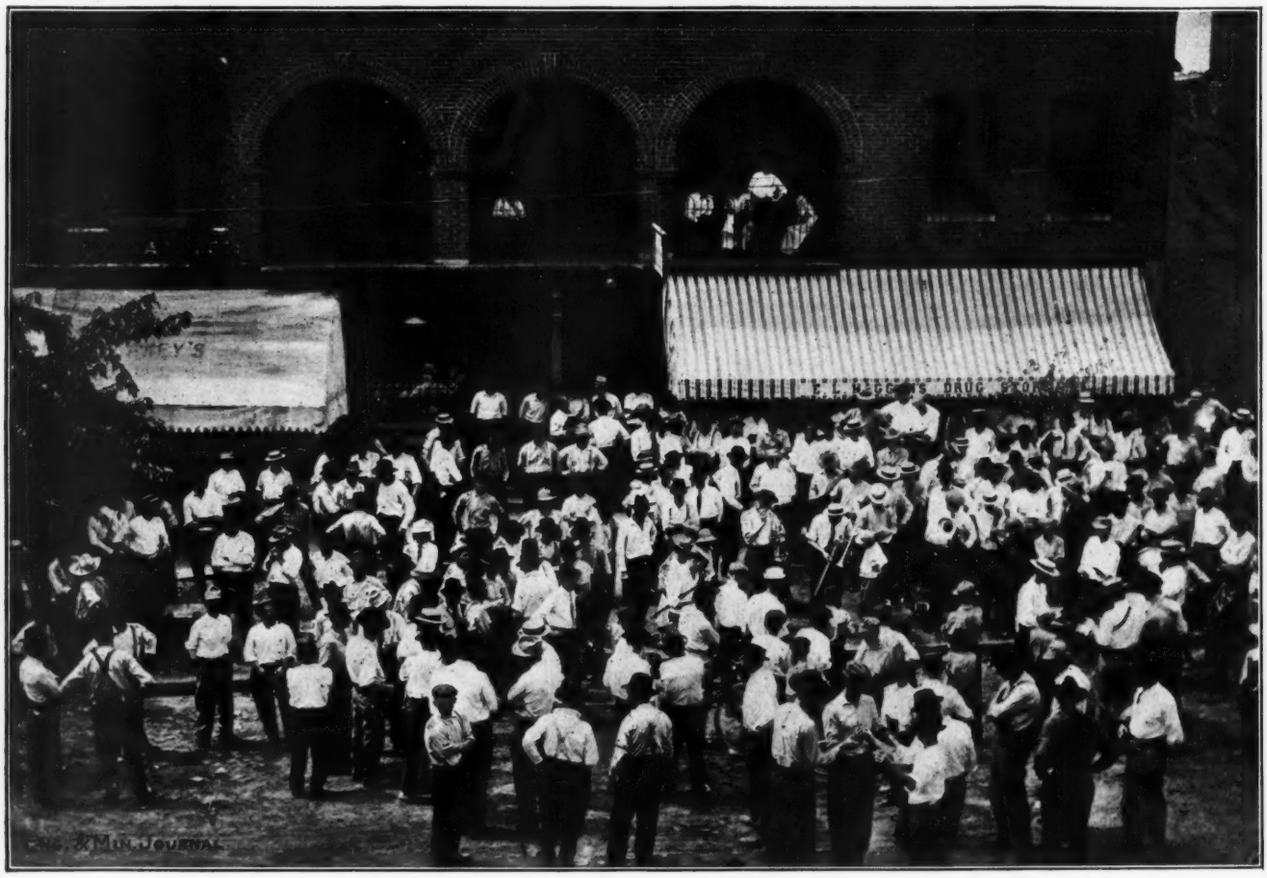
This is, however, a minor criticism and is in no wise detractive of the value of his work as an exposition of the art of zinc smelting as developed in standard practice. We are enthusiastic in pronouncing this book as one of the metallurgical classics.

PHOTOGRAPHS FROM THE FIELD



THOMPSON & PORTER ELECTRIC-SHOVEL GRAVEL-MINING PLANT, AT IGO, CALIF.

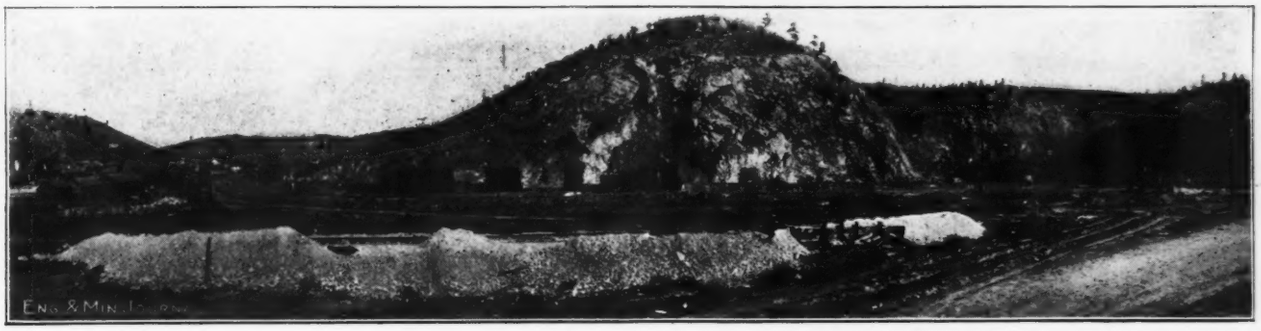
This unique Shasta County plant has a capacity for 200 cu.yd. daily, the only water used is that required for sluicing Plant includes shovel, elevator, revolving screen, sluice boxes and stacker. It moves on rollers.



STRIKING LEAD MINERS AT FLAT RIVER, MO.

The strike began Aug. 16 and ended Aug. 26, the men gaining their point for increased pay, but losing on recognition of the union.

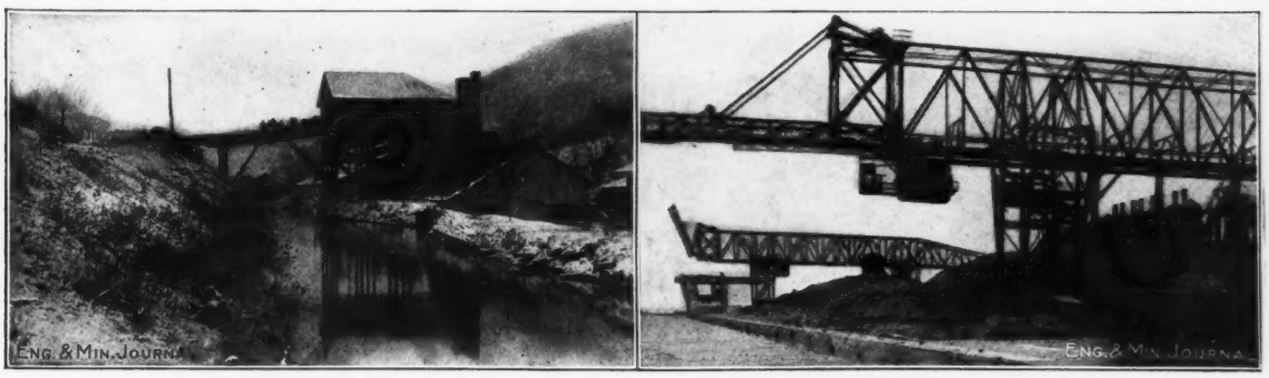
CHICAGO IRON MINE OF COLORADO FUEL & IRON CO., HARTVILLE, WYO.



GENERAL VIEW OF SUNRISE PROPERTY, ANOTHER WYOMING IRON MINE

A CLOUDBURST RESULTED IN A FLOOD AT RAWHIDE, NEV., LATE THIS SUMMER

Flooded Main Street of Rawhide — Water at office of Nevada New Mines Co.



OLD IRON FURNACE STILL IN COMMISSION COMPARED WITH A MODERN BLAST-FURNACE PLANT

Cold-blast charcoal furnace with "mulely" skip hoist, water-wheel blower. Daily output 5 tons of pig.

This 500-ton plant includes hot-blast stoves, electric skip hoist, and ore unloading bridges with 5-ton grabs.

Chilean Iron Ore

In the hearing of the Government vs. the Steel Corporation, on Oct. 8, two vice-presidents of the Bethlehem Steel Corporation told of iron-ore reserves sufficient for 60 years supply that the company recently acquired near the coast of Chile. This, they said, can be mined and shipped to South Bethlehem furnaces cheaper than ore can be obtained from Lake Superior district.

Charles Austin Buck, one of the Bethlehem company's vice-presidents, said that his company uses between 1,250,000 and 1,500,000 tons of iron ore a year. Part of this supply comes from Cuba, where the company gets 400,000 tons a year, part from the Kirunavaara mine in northern Sweden, where it gets 400,000 tons a year, and the rest being obtained in this country from the Lake Superior district and from the Adirondacks.

As to the Bethlehem Corporation's future supply, Mr. Buck said it would come from the Tofo mine in Chile near Coquimbo, about four miles from the coast. This mine was acquired by the Bethlehem company within the last six months. It has 60,000,000 tons in sight with no development work.

This rich ore is sticking out of the ground on a conical hill unconcealed by earth. We believe there is 150,000,000 tons on the property. We intend to bring it through the Panama Canal to Philadelphia and will operate our own boat line for this purpose.

He said that preparations were being made to ship 1,500,000 tons of ore a year through the canal.

We estimate that we can deliver this exceptionally high-grade ore very much cheaper into Bethlehem from these foreign ore beds than we can any of the Lake Superior ore.

Henry S. Snyder, another vice-president of the Bethlehem company and president of several of its subsidiaries, was called to substantiate Mr. Buck's testimony. He estimated that there is 3,230,000,000 tons of iron-ore reserves on the north coast of Cuba, that the Bethlehem company owns 770,000,000 tons of it and that the Steel Corporation owns only 200,000,000 tons. He said that the Bethlehem company would be bringing its ore from the new mine in Chile within two years, and thought there was enough there to last the company about 60 years.

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Smelting in Bond Provisions

The bonded-smelting warehouse provision contained in "N. Subsection 1" of the customs administrative section was retained by the conference committee in nearly the Senate form, the final draft accepted by the conference being as follows:

N. Subsection 1. That the works of manufacturers engaged in smelting or refining, or both, of ores and crude metals may, upon the giving of satisfactory bonds, be designated as bonded smelting warehouses. Ores or crude metals may be removed from the vessel or other vehicle in which imported, or from a bonded warehouse, into a bonded-smelting warehouse without the payment of duties thereon and there smelted or refined, or both, together with ores or crude metals of home or foreign production: Provided, That the bonds shall be charged with the amount of duties payable upon such ores and crude metals at the time of their importation, and the several charges against such bonds may be canceled upon the exportation or delivery to a bonded-manufacturing warehouse established under paragraph M of this section, of an amount of the same kind of metal equal to the actual amount of dutiable metal producible from the smelting or refining, or both, of such ores or crude metals as determined from time to time by the Secretary of the Treasury: And provided further, That the said metals so producible, or any portion thereof, may be withdrawn for domestic consumption, or transferred to a bonded-customs warehouse, and withdrawn therefrom, and the several charges against the bonds canceled upon the payment of the duties chargeable against an equivalent amount of ores or crude metals from which said metal would be producible in their condition as imported: And provided further, That on the arrival of the ores and crude metals at such establishments they shall be sampled and assayed according to commercial methods under the supervision of Government officers, to be appointed by the Secretary of the Treasury and at the expense of the manufacturer: Provided further, That antimonial lead produced in said establishments may be withdrawn for consumption upon the payment of the duties chargeable against it as type metal under existing law and the charges against the bonds canceled in a similar sum: Provided further, That all labor performed and services rendered pursuant to this section shall be under the supervision of an officer of the customs, to be appointed by the Secretary of the Treasury, and at the expense of the manufacturer: Provided further, That all regulations for the carrying out of this section shall be prescribed by the Secretary of the Treasury.

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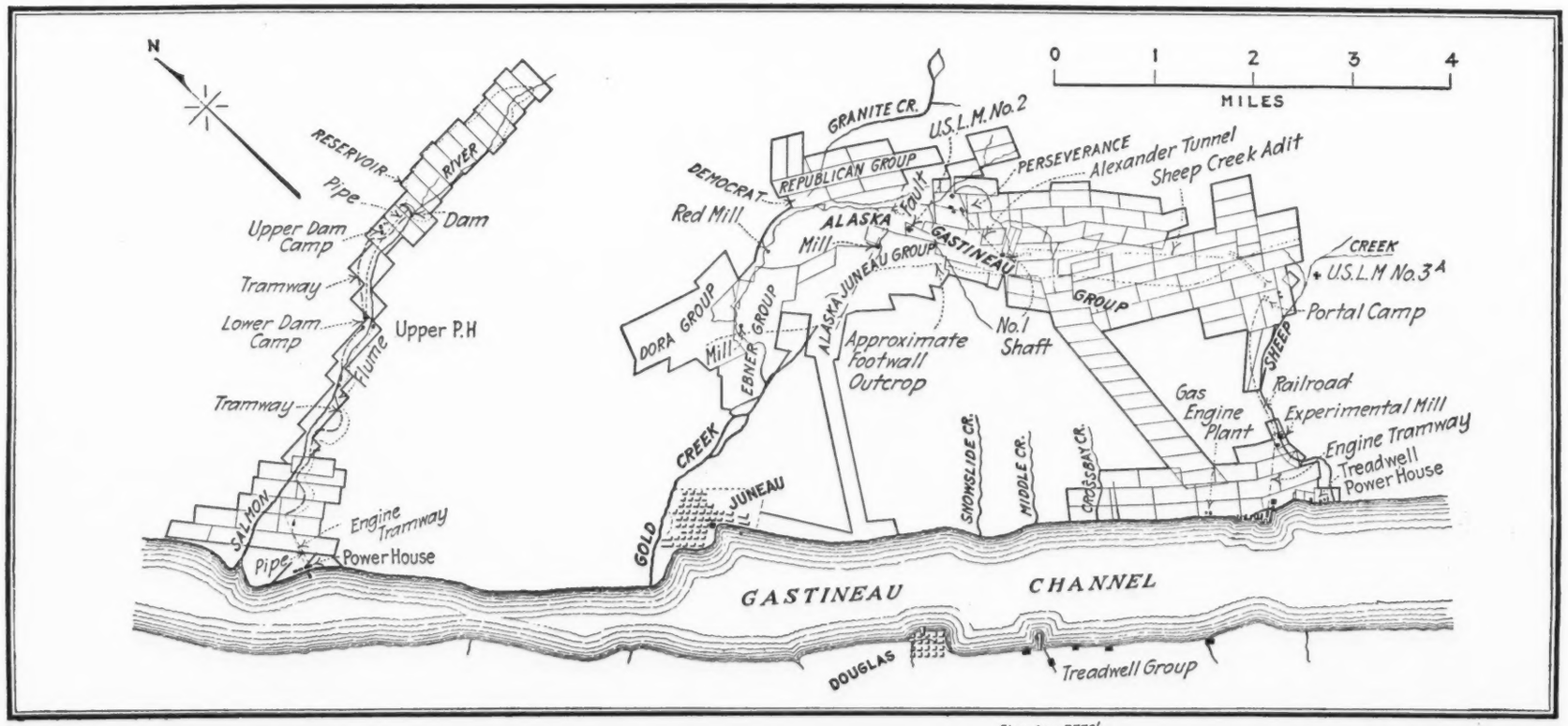
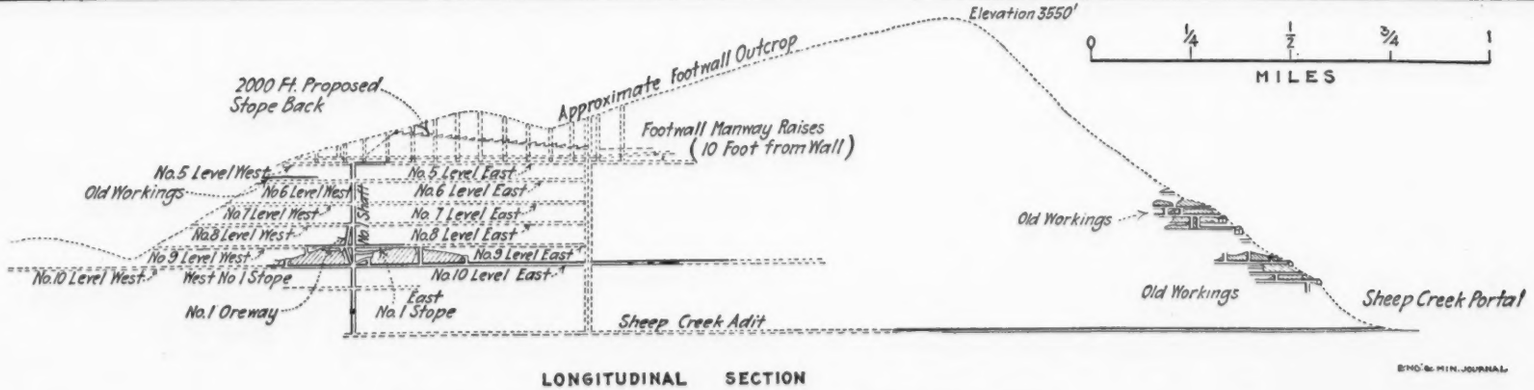
Work at the Alaska Gastineau

Hayden, Stone & Co. have issued a circular dated October, 1913, which gives the latest developments and sums up the situation at the Alaska Gastineau property of the Alaska Gold Mines Co., near Juneau, Alaska. It will be remembered that the original estimate of the engineers gave 50,000,000 tons capable of yielding $1.50 per ton. Development operations have led the sponsors to state that the reserves will probably run into the hundreds of millions of tons, although no measurements and assays are presented. These developments consist of drifting and crosscutting on the Alexander level of the Perseverance lode, development of another vein parallel to the Perseverance on the north and the encountering of the Perseverance lode on the Sheep Creek adit level. The Perseverance developments to the east extend the Alexander level to over 3000 ft., and the last four crosscuts to the ore from this level encountered ore averaging over $3 per ton, decidedly higher than what has been regarded as the average of the deposit. It is not stated whether all of the new ore encountered was of this grade. To the west of the shaft on this level, also the latest crosscut at a distance of 600 ft. from the shaft, is said to penetrate ore for over 150 ft., of good average value not quantitatively expressed. This width is greater than usual.

The new deposit on this level has been opened up for something over 300 ft., and is showing up consistently, with a content approximately that of the Perseverance—whether higher or lower is not stated. Developments in the Sheep Creek adit are considered the most important. This, it will be remembered, is the new working entrance, driven from the opposite side of the ridge from the old Alexander adit of the Perseverance mine and 700 ft. lower. It has been reported that the adit has encountered material of the same character and value as the Perseverance ore, and it is a fair conclusion that it is the same deposit. Probably it has not yet been possible to crosscut so as to determine the width of the lode at this level, and no sampling results are included in the report. The point of intersection is 1000 ft. east of the most easterly working on the Alexander level, probably indicating at the new horizon an important extension of the deposit on the strike in this direction. A total length on the strike of over a mile is indicated by existing exploration. The statement is made that at an adjoining property the same deposit





LONGITUDINAL SECTION

MAP AND SECTION OF THE ALASKA GASTINEAU WORKINGS

has been encountered 1000 ft. below the Alexander level showing an excellent value at that depth.

Progress on the Sheep Creek adit has been at the rate of over 500 ft. per month, said to be probably a record in the driving of large tunnels. In fact, it is nothing of the sort, and large tunnels can be more rapidly driven, speaking generally, than small ones. A sustained rate of progress of 500 ft. per month, however, indicates good work, well above the average. It is expected that the adit will be under Perseverance workings this month, and that a raise will be holed through before December. By the end of January, the adit should be advanced to the shaft being sunk from the Alexander level, which will have arrived at the level of the new adit by that time. The continuation of this shaft has already been raised through to the surface.

At the new mill site, tributary to the Sheep Creek adit, the timber has been cleared for an area of 1500 ft. square, the coarse- and fine-crushing plants have been located and in a general way the main concentrating and amalgamating building, so that grading on all of them is progressing. Contracts for the steel will be placed in October, and there is no doubt but that the mill can be completed as soon as the mine is ready to furnish the ore.

The big 165-ft. concrete dam at Salmon Creek is being built and will be finished before the end of the year, ahead of schedule time. The section of the power plant in commission at present can furnish 2000 hp., and the complete installation will have a minimum capacity of 6000 and a maximum of 8000 horsepower.

It is stated that within the last few weeks the company has decided possibly to make a radical departure in the treatment of low-grade gold-bearing ores. By a process whose efficiency has been thoroughly proved, it will be possible to slough off the greater part of the gangue at the first operation. The exact nature of this new method is not disclosed.

Some anxiety seems to be caused the company by slurs cast on the weather of Juneau. Thus it is stated that contrary to a rather widespread impression climatic conditions are such as easily to permit of work at the property the year around. There have been other statements published to the effect that the climate is much like that of Boston. This is hard on Boston. As a matter of fact, work near the sea can be carried on all the year around, but not easily. There are few places wetter than Juneau. Surface work a few thousand feet back from the water is seriously interfered with. At the Perseverance surface plant, low temperatures, heavy snows and the constant menace of snowslides, make winter construction difficult or impossible. It is true, however, that with the property in operation, climatic conditions will not appreciably interfere with work.

The circular concludes with the statement that when it comes time to increase the original 6000-ton milling unit to the ultimate contemplated capacity of 20,000 tons, new funds will be necessary. This, it is said, may involve the sale of additional securities, but not in anything like the same proportion, so that the probabilities of earnings per share greatly in excess of those previously indicated are said to be thought excellent.

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Diamond Mine Taxation in German South-West Africa is now computed on the following basis. If T be the tax; V the value of the output; and C the working costs, then

$$T = 0.66V - 0.70C,$$

according to a British consular report.

Stripping Iron Ore with a Dredge

The steam shovel has generally been used on the Lake Superior iron ranges for stripping the overburden from shallow deposits, ever since John T. Jones, the inventor of the step-process furnace, first demonstrated in the Mesabi district the feasibility of stripping by machinery. That was a quarter of a century ago, and since then the steam shovel has been used almost to the exclusion of other devices for this work.

A few years ago the grab system of stripping was tried at the Grant mine, only to be succeeded by the steam shovels. The Interstate Iron Co., a subsidiary of the Jones & Laughlin company, is now about to try an entirely new plan. An attempt will be made to use suction dredges to move the surface material overlying ore deposits on the Mesabi range. The plan will be tried in the Grand Rapids district, near the Mississippi River, where the company several months ago obtained control of large mineralized areas.

The Pittsburgh Steel Ore Co. is already trying the hydraulic method of stripping on the Cuyuna range. For that reason there is keen interest in the result of the Interstate company's new experiment. The Jones & Laughlin engineers believe the scheme feasible, with conditions such as exist. They hesitate to say in advance that the innovation will prove practicable, but they have carefully worked-out figures indicating that in the particular field concerned, stripping can be cheaper by dredge than by steam shovel and exploratory work can be conducted more satisfactorily. The hydraulic method, while a success in the Cuyuna district, manifestly has its limitations. Dredging, it is contended, can be employed in ground wherever it is practicable to utilize the steam shovel and where ample water is available.

The dredging system will be tried at Lot 7, Section 13, 55-26. A large barge will be launched on the Mississippi River, whence it will be floated into a canal to be excavated by the dredging machinery carried upon the craft. The barge is of Washington fir, 77 ft. long, 36 ft. wide and 6 ft. high. Two 350-hp. boilers will be installed. Should the experiment work out as is hoped, the equipment will be supplanted with boilers and dredges of greater capacity and operations will be expanded. Meanwhile, two exploration shafts are being sunk at the Fargo and Buckeye properties and mine buildings, including engine and boiler houses and shops, are being built.

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Calcite Solution in Philippine Veins

Many gold-quartz veins of the Philippines contain considerable amounts of calcite. The surface waters, furthermore, carry remarkably high amounts of carbonic acid, according to F. T. Eddingfield, in the *Philippine Journal of Science,* April, 1913, the amount present in the water varying from 0.22 to 0.45% by volume. Since the dissolving power of water on calcite is increased from 18 mg. per liter to 700 or 900 mg. by saturation with carbonic acid, the vein calcite is readily dissolved and removed by these surface waters. The result is a honeycomb quartz stained with iron and manganese, and free of calcite. The removal of calcite in this manner results in enriching the vein at the surface, since the ratio by weight of gold to gangue material is thus increased.

Utah Copper

General Manager Gemmel, of the Utah Copper, says that they have recently had another record day when 30,000 tons of ore were shipped from the mine to the mills, says the *Boston News Bureau*. The company has 425 ore cars in service, with a capacity of 56 tons each. A single train hauls 2600 tons. In addition to this the Rio Grande R.R. hauls 7500 tons daily. Four Mallet compound engines are in service on the Bingham & Garfield line and 25 new steel ore cars have been ordered.

To produce this tonnage the company has 22 steam shovels operating in various parts of the property. Fifteen shovels are used on the original Utah Copper estate, two of which are regularly in one and 10 that alternate between the porphyry and stripping. Four of the company shovels are used in stripping on Boston Consolidated territory, and three additional shovels are used in stripping under a contract with the Utah Construction Co. During September, 55,000 tons of stripping and ore were broken down daily. About 1½ times as much waste is removed as ore. The ore production during September was slightly in excess of 21,000 tons daily, about the normal capacity of all the sections of both mills. A larger tonnage could be milled by crowding the plants, but the percentage of recovery would be lower.

Utah Copper as at present developed will require the moving of twice as much ore and material as that handled in the excavation of the Panama Canl. There are now approximately 80 miles of underground workings.

Electric Zinc Smelting

The Société pour l'Electrometallurgie du Zinc is being formed at Lyon, France (address, 6 Rue Grolée), with a capital of 1,000,000 francs. This company intends to exploit the process of Cote & Pierron.

According to the *Journal du Four Electrique* the production of spelter by electric furnaces in Sweden in 1912 was 3228 metric tons.

The Canadian Department of Mines is erecting a furnace of about one ton daily capacity in the old works of the Canada Zinc Co., at Nelson, B. C.

It is reported that the Sulphide Corporation is going to erect an electric furnace in its smelting works at Cockle Creek, N. S. W. This furnace will be of 500 hp., and in design will follow lines determined in Sweden. The source of the energy will be a Mond gas plant, arranged for ammonia recovery, in connection with which sulphuric acid made from the roasting furnace gases will be used.

The Lake Superior Strike

The Lake Superior copper-mining companies will inaugurate the eight-hour day before Jan. 1 next, and will appoint a day or half-day each week as "grievance day," when the general manager or a representative will hear any complaint of employees, and subsequently investigate and adjust every legitimate grievance. The mines will not recognize the Western Federation of Miners nor employ its members. No minimum wage scale for all mines will be adopted. The one-man drill has come to stay.

These statements, says the *Boston News Bureau*, were made by a committee of the mine managers to the committee of the Copper Country Commercial Club, which has just completed an investigation of the strike called by the Western Federation of Miners. They are contained in the committee's report to Governor Ferris, officials of the Western Federation and other interested parties. Copies of the report will be distributed among the strikers and present employees. From data collected for its report the committee will draft a proposal for the settlement of the strike and probably will endeavor to get a vote of the actual employees of mines, ignoring the Western Federation and its officials.

The report shows that 14,300 men were employed at the various mines on surface and underground previous to the strike. The number at work on Oct. 8 was 5445, of whom 2079 were underground.

The report reviews the financial history of the 70 mines that have operated in the Lake Superior district from 1848 to 1910, showing that with the Calumet & Hecla eliminated, the copper industry here has just about paid back to shareholders the money expended. The report shows the average wage of miners to be $3.20, and of trammers, $2.63. The Western Federation demand is a $3 minimum.

A Substitute for Gasoline

According to newspaper reports, there will be something of a revolution in the refining of oil if the new method of making gasoline proves to be the success claimed for it by the Standard. Under a new process which the Standard Oil Co. of Indiana is installing, at Whiting, it is believed that it will be possible to convert 75% of the crude petroleum into gasoline. The process opens the way for breaking up the hydrocarbons of petroleum into the combinations needed and condensing them under compression. It is understood motor spirits will appear in the markets soon at about 4c. less per gallon than the present price of gasoline.

Kimberlite Company's Charter Revoked

It is reported that the Kimberlite Diamond Mining & Washing Co. has been barred from further operations in Arkansas. The company is one recently organized to operate near Murfreesboro in Pike County. Suit for ejectment and damages was brought by M. M. Mauney, a neighboring operator. The Kimberlite company, a foreign corporation, had the case transferred to a Federal court. It appears that this is expressly forbidden by an act of the 1907 Arkansas legislature. The violation of the act by the Kimberlite company resulted in its charter being revoked by the secretary of state.

Itinerary of Mine Rescue Cars

BILLINGS CAR NO. 5

Arrive	Leave	Address
Oct. 17	Oct. 24	Burke, Idaho
Oct. 24	Oct. 31	Mace, Idaho
Nov. 1	Nov. 8	Mullan, Idaho (Morning Mine)
Nov. 9	Nov. 18	Mullan (Hunter Mine)
Nov. 20	Nov. 28	Phillipsburg, Mont.
Nov. 30	Dec. 16	Butte, Mont.
Dec. 17	Dec. 23	Elkhorn, Mont.

CORRESPONDENCE AND DISCUSSION

Milling in Southeastern Missouri

In regard to Mr. Thacher's criticism of the historical part of my article, I wish to thank him for calling attention to a mistake which I appear to have made. He, if he is the man whom I take him to be, is probably best able of anyone to decide questions in regard to the early history of the Missouri lead district. The facts are undoubtedly as he states them. My informant, no doubt, did not know of these earlier attempts, although he is well informed in regard to the district.

I thought at first I would let the matter of the automatic samplers go. But now I think that Mr. Thacher will see that my statement concerning automatic weighers of the belt type in dusty places has been confirmed by the total silence of the manufacturers of such devices in spite of the suggestion that no matter how dusty the place is, belt-weighers can be made to work efficiently by playing an air-hose on them from time to time. Mr. Thacher, no doubt, realizes that manufacturers are always only too ready to resent criticism of their wares, especially when it affords them an opportunity for free advertising.

My statement was made simply as a fact long known to me through discussion with millmen who have used such devices. Personally, I think that weighing devices should be used wherever they are practicable. Indeed, I think that automatic weighers should be used much more than they are at present; still their use cannot be promoted by trying to get them installed in places where they are not able to work satisfactorily. As many millmen did not and do not realize the shortcomings of these devices, I made the statement in question in the Missouri article, since it was only fair to the designers of this excellent mill to show just why they had not installed an automatic weigher at so well designed a plant.

From June 21 to Aug. 30, this statement concerning automatic weighers has gone uncontradicted by any manufacturer of such apparatus, and no one of the many users has taken exception to it except the gentleman from Bertha.

Finally, such a well informed engineer as Mr. Messiter, who, as I remember it, is somewhat of an authority on such matters, confirms this statement as to its accuracy in regard to all devices in common use heretofore, but notes a device that he thinks will overcome this difficulty.

As to automatic weighers of the dumping-pan type, I will remark that I know of a millman who, with automatic sampling of heads and tails and careful sampling and weighing of concentrates by outsiders, gets indisputable extractions of over 100% for periods of as long as a year, when he uses one of the dumping-pan weighing machines. The scales are as much to blame as his sampling. This fool's paradise of a milling plant, which never gets below 95% extraction, and which has got, according to annual reports of the company, as high as 110% extraction, as I remember the figures, averages about 99%. The judgment of an experienced millman as to his work, especially when he makes no extraordinary claims in regard to extractions, is often far more accurate and much more worthy of credence than the so called facts that are obtained from crude sampling and weighing of the ore into which these automatic weighings and not especially refined sampling procedures often degenerate.

CLAUDE T. RICE.

Chicago, Ill., Sept. 10, 1913.

Questions and Answers

LOCOMOTIVE HAULAGE IN METAL MINES

To what extent is locomotive haulage employed in metal mines? Is it of such general use as in coal mines?

B. L. W.

There is nothing of a statistical nature on this subject that we know of. We cannot do anything more than give some general ideas.

Locomotive haulage is general in all large metal mines. As compared with coal mines, we think the relative tonnages of production may reasonably be accepted as an index. In 1912 the coal mines of the United States produced about 512,000,000 tons of coal; the metal mines produced about 131,000,000 tons of ore. We imagine that the mines of nonmetallic substances other than coal, such as the phosphate mines, salt mines, etc., may have produced 10,000,000 tons of material in the aggregate.

It is necessary, however, to make a further allowance in the case of the metal mines, which usually have to handle a great deal more waste rock than in the case of the coal mines. Some of the large copper mines and iron mines have to handle as much as one ton of waste rock per ton of ore. We will venture to guess that our metal mines have to handle about 200,000,000 tons of ore and rock annually in the aggregate.

The ore of the metal mines goes to a large extent to smelting works, all of which are equipped with elaborate railway and tramway systems. They deal in the main with concentrated products, the aggregate weight of which is less than the weight of the crude ore produced by the mines, but in metallurgical works the products have to be handled several times. The product of the smelting works is again rehandled in the refineries. There are in the United States 110 copper-, lead- and zinc-smelting and refining works and 314 iron-smelting works.

We can give a fragmentary idea of things in a little different way. The copper mines of Butte, Mont., produce about 5,000,000 tons of ore per annum. The number of electric locomotives now in use in Butte mines is 67.

These data pertain only to the mines of the United States and do not in any way include the mines of Canada, Mexico and other foreign countries, the ores and products of which, to a very large extent, come to this country for smelting and refining.

EDITORIALS

The Stock of Copper

At the end of September the combined European-American stock of copper was only 83,418,694 lb. All of this was not immediately available, inasmuch as the European figures include Chile bars and other material requiring refining before use. The stock at American refineries was only 29,793,094 lb., or less than a week's output. Up to a year ago no one supposed that business could go on smoothly with a stock of much less than 40,000,000 lb. There is a great variety among the forms of wirebars, cakes and ingots wanted by the manufacturers of wire, sheet, brass, etc., and the refiner reckons that he ought normally to have about 10 days to comply with specifications.

The fact that business has proceeded without any friction in the face of the dwindling stock is evidence of the overwhelming extent to which the copper business is done on contracts and the insignificance of over-the-counter transactions. The manufacturers in their last purchases covered their requirements for October, partially for November and to some extent for December; and copper is constantly going from the refineries to fill those contracts. The stock on hand at any moment is of interest only to those belated or underestimating buyers who need immediate shipment. The absence of any flurry among them indicates their ease in the matter of supplies.

A wire drawer said to us not long ago, "If the stocks keep on diminishing the refiners' statistics may some day show a minus quantity." That would, of course, be impossible. However, in the light of recent experience it seems likely that stocks might be reduced nearly to zero without creating any serious disturbance.

The disturbance would arise if the manufacturers should come into the market to complete their November-December requirements and be told by the selling agencies that their order books for those months were filled, or nearly filled. Then there would be a scramble. It is the delay of the buyers in thus coming into the market and the fact that the sellers' order books are not yet satisfactorily filled that has caused the late nervousness, which has been heightened by the suspicion that the ultimate consumer may not be using so much copper as he was. Of course, the manufacturer—be he wire drawer, brass maker, or something else—is in just about the same position as the refiner. He is waiting for his customers' orders and does not want to buy copper until he gets them.

However, there is one thing that the reduction in the copper stock certainly does, viz., it relieves the producers and selling agencies of lugging any load to speak of and removes all necessity on the part of anybody to press copper for sale in order to lighten his load. There is a big difference between the cost of financing 30,000,000 lb. of copper and 230,000,000, especially when money is as dear as it is now.

Recent events have also taught us another thing, viz., that a good many manufacturers who have thought that they had to have Lake copper can in fact do with electrolytic. Their supply of Lake copper having been cut off, they have had to use electrolytic or nothing at all. Of course, this is no surprise to metallurgists, who have long been aware that save for a few special purposes the electrolytic copper is the better copper, anyway. Present experiences in this matter may result in some market changes when the supply of Lake copper is restored to the normal. For the moment there is an unpremeditated, entirely innocent, corner in Lake copper, which enables the single holder to obtain its own price, as to which it has been eminently reasonable, it is only fair to say.

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U. S. Ore Production

The U. S. Geological Survey has published a table, which we conceive to be the best possible index of the magnitude of our mining industry—far superior to summations of value in which the coal that goes into the manufacture of coke and the coke that goes into the manufacture of pig iron are counted thrice, and in which some substances are entered as of their value at the mouth of the mine and other substances as of their value at New York, including smelting cost, freight, refining charges, etc., and in which all such heterogeneous, duplicating and even quadrupling figures are indiscriminately added together to produce a grand total, which, after all, is without any particular meaning. The improved table to which we now refer is entitled the "Production of crude metallic ores from domestic mines in 1911 and 1912, in short tons." After all, the ton of ore hoisted from the mine is the real index of mining activity. The more metal we may produce the better off we may be commercially and economically, especially if it reflect the mining of a high grade of ore, but the more tons of ore we produce the more men do we employ, the more plant, and in general the more activity do we display. The table is as follows:

Substance	1911	1912
Iron ores	46,023,540	63,859,728
Manganese ores	2,752	1,864
Manganiferous iron ores	3,006	3,247
Chromium ores	134	225
Tungsten ores	16,500	34,000
Titanium ores	.....	6,900
Aluminum ores	174,292	179,040
Gold ores	9,884,684	9,736,203
Silver ores	739,200	848,574
Quicksilver ores	138,525	155,693
Tin ores	42,200	3,000
Vanadium and uranium ores	8,468	18,000
Copper ores:		
Western States	18,207,566	23,431,301
Central States	10,978,827	11,411,941
Eastern States	801,842	830,089
Total	29,988,235	35,673,331
Copper-lead ores	6,923	14,614
Lead ores:		
Western States	2,157,817	2,388,598
Central States	3,794,712	4,064,366
Total	5,952,529	6,452,964
Zinc and zinc-lead ores:		
Western States	1,356,781	1,344,222
Central States	10,629,269	11,899,185
Eastern States	413,332	497,832
Total	12,399,382	13,741,239
Grand total	105,380,370	130,728,622

The classification of this table is not in all cases perfectly clear. "The figures for gold ore include siliceous, pyritic and other ores in which the predominant value is gold. The production of silver ore is mainly that of silver-gold ores in which the value of silver exceeds that of gold." We understand this to include all of the gold and silver ore that is treated by the amalgamation and cyanide mills, and all of such ore going to the smelters as is noncupriferous, nonplumbiferous and nonzinkiferous. Ores containing copper, lead and zinc going to the smelters who win such metals are apparently classed according to their predominant base metal in spite of the fact that they carry gold and silver and indeed yield a very large part, probably the larger part, of our precious-metal output. Assuming our interpretation to be correct, let us say that we consider such a classification to be wholly rational and to convey a proper idea of the respective branches of the mining industry.

Now, regarding the figures, the most striking feature we think is the relative unimportance (in point of tonnage) of the gold and silver mining industry and the superlative importance of iron mining, the latter contributing nearly 50% of the total tonnage, the larger part coming from Michigan, Wisconsin and Minnesota. Next in order is copper mining, then zinc mining and finally lead mining, dismissing all ores whereof the output is less than a million tons annually.

What does the grand total of 130,000,000 tons mean? Unfortunately, we have no reliable data indicating the approximate cost of mining. The census figures ought to give us a clue and perhaps they would if they could be unraveled, but how to do it we don't know. If we guess the whole output to average a cost of $2 per ton, or a total of $260,000,000, we don't think we shall be far out of the way. Nor if we venture the guess that about 60%, or $156,000,000 goes for labor, and about 10%, or $26,000,000, for power; the remaining $78,000,000 is spent for timber, explosives, illuminants, lubricants, track, tools, machinery and perhaps a thousand varieties of supplies.

All of the figures and references in this article are exclusive of the gold placer mining and dredging enterprises. These are of a good deal of importance in several districts, but in comparison with the metal-mining industry as a whole they do not bulk very large.

The figures that we have been considering in this article relate only to the metal-mining industry, pure and simple. They take no account of the coal-mining business, which in point of tonnage is upward of three times greater, nor of what are commonly called the other nonmetallic minerals. The latter include phosphate rock, pyrites, talc, salt, cement rock, fluorspar, gypsum, borax, barytes, graphite and a multitude of less important minerals, which in the aggregate amount to some millions of tons.

An Excellent Chute Gate

Among the details of practical mining described this week in the JOURNAL, readers will find the bulldozing chamber and the chute gate installed by Mr. Jackson to be devices of unusual merit. The idea of disposing of large boulders by blasting them in a special chamber and thus preventing the chute from choking, is so simple and easy that one wonders at its never having been practiced or described before.

The chute gate, however, is a device of perhaps more general application. It is about the best of which we know, taking everything into consideration. The most highly developed gates in general use are either of the air or hydraulically operated type, or are similar to the finger chutes originating at the Treadwell. This counterbalanced, underswung gate would seem to be superior to either. It is remarkable that the underswung principle is so rarely applied. In most gates it is attempted to chop off the ore stream by swinging down from above and there is always the risk of sticking on a big rock. With a gate cutting off the stream from below, no possibility of such sticking exists, and the danger of a runaway chute and a buried car is done away with. Compared with the mechanically operated types, this gate is possibly a little slower and it requires a certain amount of strength for operation. It is so much cheaper, however, more rugged, and simpler, that in most cases it is to be preferred. The fact that the operator stands on a platform, out of danger from flying rocks or a rush of material, is not the least point in its favor.

The Future of the Motor Truck

To a stranger reading the technical press and the Sunday editions of the daily press, it would seem that the horse in this country must be about to vanish as a source of haulage power. The increase in the use of motor trucks has been really astonishing, and it must be admitted that their advantages, especially in congested city streets, are manifold. A skeptical and shrewd observer, however, might wonder whether the elimination of the horse is to be complete in quite so short a time, and even whether the inroads of the motor truck are altogether the results of its merits and are not based largely on a powerful and a clever press campaign. Manufacturers, dealers, designers, garage owners, oil companies, electric companies, are all enthusiastic boosters for the mechanically propelled vehicle, while the horse is dumb and its advocates that are bound by financial retainers are few and generally inarticulate. One with his ear to the ground might even occasionally catch the echoing knocks of hard-headed operators who, after a trial of motor trucks, have reverted to the primitive horse, justifying their reactionary attitude with the ignoble plea that the horse is cheaper.

It was inevitable that the motor truck should claim attention for mine-haulage purposes, and many have been bought and installed for that purpose. Since this is a new and interesting development of the ever-present and ever-expensive problem of transporting ore and material, the JOURNAL has attempted to collect all the data on this subject that was obtainable. Several of the more interesting communications resulting from this inquiry have already appeared, and in this issue we present the rest of the data received, together with a summary and conclusion.

Our opinion is this: That for miscellaneous work, as a heavyweight errand boy, so to speak, around a large or medium-sized mine, the motor truck is unexcelled; but as a regular means of transporting ore or fuel in a systematic manner, it is still on trial. Trucks must be better all through, and must be more specificially designed

for the work they have to do. The truck manufacturers must go through the experience of the drill and pump manufacturers and produce a machine built to stand hard usage to a degree now quite beyond their comprehension.

We venture a prophecy: The truck manufacturers are now, as it were, accelerating their load. They are increasing the field of usefulness of their product, and are producing trucks at least as fast, and probably faster than they will be consumed when their legitimate field is full and new trucks are required only to replace those worn out. When this state of saturation is nearly reached and supply begins to exceed demand, more vigorous efforts will be made to find new territory, and more attention will be paid to special design. The mining field will then be emphatically in demand. The manufacturer who is first to realize this and to build a really successful truck for ore haulage should be able to capture the business.

CIVIL SERVICE EXAMINATIONS

The Civil Service Commission announces an examination for aid, on Nov. 5 and 6, 1913, to fill vacancies in the Bureau of Standards, at salaries of $600 and $720 per year. Competitors will be examined in: (1) Elementary algebra, geometry and trigonometry, 30; (2) general physics, 30; (3) elementary mechanical drawing, 20; (4) education, training and experience, 20. Graduation from a mechanical-training, technical or scientific school or equivalent training in a scientific or technical laboratory is requisite. Applicants must have reached their nineteenth but not their twenty-fourth birthday. Persons who desire this examination should apply to the U. S. Civil Service Commission, Washington, D. C., for application Form 131-2, Aid (male), No. 1081.

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The Civil Service Commission announces an examination for electrometallurgist, on Nov. 10, to fill a vacancy in the Bureau of Mines, at from $1800 to $3000 per year, to conduct investigations and inquiries into metallurgical problems, the investigation of ores with reference to their constitution and treatment, both mechanical and chemical, including smelting, and especially the investigation of ores with reference to the feasibility of their treatment by electrometallurgical processes. Competitors will be rated on: (1) General education and scientific training, 40; (2) practical experience and fitness, 40; (3) publication or thesis, 20. A training equivalent to graduation from a college or university of recognized standing, including courses in geology, chemistry, physics and metallurgy, and not less than three years' experience in electric-furnace work, are requisite. If a thesis is submitted under (3), it must present the results of original investigation in electric furnace work. Applicants possessing a thorough knowledge of metal mining and metallurgical work, including smelting operations, will receive additional credit under (2). Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons desiring this examination should apply for Form 304, Electrometallurgist (male), No. 1082.

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The Civil Service Commission announces an examination on Nov. 10, for metallurgist, for work with smelting fumes, to fill a vacancy in the Bureau of Mines, at from $2700 to $3600 per year. The duties of the position will be the investigation of smelting fumes and possible methods of preventing or controlling the same. Competitors will be rated on: (1) General education and technical training, 40; (2) professional experience and fitness, 40; (3) publication or reports, 20. A training equivalent to that required for graduation from a college or university of recognized standing, including courses in chemistry, physics, metallurgy and mineralogy, and not less than three years' experience in the chemical and metallurgical phases of smelter operations in both copper and lead, and in the examination of smelter fumes, are requisite. Under (3) the applicant must have demonstrated ability as a writer of reports. Applicants must have reached their twenty-fifth but not their fortieth birthday. Persons who desire this examination should apply for Form 304, Metallurgist (male), No. 1084.

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The Civil Service Commission announces an examination on Nov. 10, for metallurgist, to fill a vacancy in this position in the Bureau of Mines, at Salt Lake City, Utah, at from $3000 to $4000 per year. The duties of the position will include especially investigations of low-grade ores and methods of testing the same, but will also include other mining and metallurgical problems. Competitors will be rated on: (1) General education and technical training, 35; (2) professional experience and fitness, 35; (3) publications or reports, 30. An educational training equivalent to that required for graduation from a college or university of recognized standing, such training to have included courses in chemistry, metallurgy and geology, and not less than five years' experience in metal mining or metallurgical operations, are requisite. Under (3) the applicant must have demonstrated ability as a writer. Applicants must have reached their thirtieth but not their forty-fifth birthday. Persons who desire this examination should apply for Form 304, Metallurgist (male), for work in low-grade ores, No. 1085.

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The U. S. Civil Service Commission announces an examination on Nov. 10, for chief metallurgist, to fill a vacancy in the Bureau of Mines, at $4000 to $4800 per year, to supervise investigations and inquiries into metal and metallurgical problems; investigation of ores with reference to their constitution and treatment, including smelting; the saving and waste of material and the increase of safety and efficiency in the production of the more important metals. Competitors will be rated on: (1) General education and technical training, 30; (2) professional experience and fitness, 40; (3) publication or reports, 30. A training equivalent to that required for graduation from a school or college of mines, and at least five years' experience in mining, engineering and metallurgical practice, are requisite. Applicants who have had experience in teaching will receive additional credit under (2). Under (3) the applicant must have demonstrated a capacity for preparing reports. Applicants must have reached their thirty-fifth but not their fiftieth birthday. Persons who desire this examination should apply for Form 304, Chief Metallurgist (male), No. 1083.

PERSONALS

Walter Belts, of Miami, is examining properties north of Phœnix, Arizona.

C. W. Purington has arrived in London from the Lena Gold district in Siberia.

John Hoy and J. A. Clifford, of Butte, Mont., are in Patagonia, Ariz., making an inspection of the Trench mine.

W. S. Ayres, of Hazleton, Penn., has just returned from an extended professional trip through British Columbia.

Julius Marcus, technical chemist, formerly with the Ray Consolidated Co. in Arizona, has gone to the Braden Copper mines in Chile.

A. Adiassewich, a Russian mining engineer, is visiting in the United States to observe American mining and metallurgical practice.

John T. Fuller, mining engineer, of Little Rock, Ark., has been appointed consulting engineer to the Arkansas State Department of Mines.

J. H. Plummer, president of the Dominion Steel Corporation, has sailed from Canada for England on business in connection with the financing of the company.

L. E. Stoddard and Henry Darlington, of New Haven, Conn., accompanied by B. D. Lawrence, of New York, are examining properties in Pinal County, Arizona.

Charles A. Banks, manager of the Jewel-Denoro Mines, Ltd., Greenwood, B. C., is in the East to examine and report on some properties in Quebec for a British company.

E. P. Ross, who has been manager of Cranberry Furnace at Johnson City, Tenn., for the past five years, has accepted a position with the Carnegie Steel Co., at the Edgar Thomson works.

T. E. Carter and J. C. Carter have associated themselves with Dr. T. Poole Maynard, with offices in the James Building, Chattanooga, Tenn., and will practice as civil, mining and geological engineers.

Charles E. Hulick, who has been superintendent of the Saucon furnaces of the Thomas Iron Co., at Hellertown, Penn., since 1903, has been promoted to superintendent of the company's Hokendauqua furnaces.

C. E. Sweet and E. L. Snider, of Kansas City, have been in Patagonia, Ariz., in connection with the settlement of the bondholders' claims on the old Mansfield property. Mr. Snider is trustee for the bondholders.

F. Close, lately manager of the Kinandam Sumatra Mining Co., has started a consulting practice in conjunction with G. T. Holloway & Co., Ltd. His address is now 13 Emmett St., Limehouse, London, E., England.

Dr. Jean Perrin, professor of physical chemistry in the University of Paris, visiting French professor, 1913-1914, delivered his first lecture at Columbia University, Oct. 13, on "Le Mouvement Brownien et la Realité Molêculaire."

Ex-Senator Simon Guggenheim has been chosen chairman of the boards of the American Smelting & Refining Co., the American Smelters Securities Co. and the Guggenheim Exploration Co. The office in each case is a new one. It is understood that he will take an active part in the management.

Richard B. Stanford, who has been consulting engineer and manager of the Bonanza and other mines in Nicaragua, has returned to his office in New Orleans. The mines have been sold to the Canadian Agency, Ltd., of New York, and Orvil R. Whitaker, of Denver, Colo., will be consulting engineer for the new company.

W. C. McKee has resigned his position as superintendent of blast furnaces of the Inland Steel Co., Indiana Harbor, Ind., and on Oct. 4 became general superintendent of the Thomas Iron Co. in charge of the company's blast-furnace plants at Hokendauqua, Hellertown, Alburtis and Island Park, Penn. He will make his headquarters at Hokendauqua.

Ernest Solvay, discoverer of the Semet-Solvay process for the manufacture of heavy chemicals, celebrated the 50th anniversary of that discovery on Sept. 2 at Brussels, Belgium, by giving more than $1,000,000 to educational and charitable institutions and the employees of his firm. The Universities of Paris and Nancy received $100,000 each.

Woldemar Hommel, who for several years was metallurgical engineer for Huntington, Heberlein & Co., in London, and later was general manager of the Metals Extraction Co., in London, and who is well known as a contributor to the "Journal," has joined the instructing staff of the Clausthal Bergakademie as docent in metallography and metallurgical engineering.

Thomas J. Drummond retired both as president and director of the Lake Superior Corporation at the annual meeting of the company, which was held at Camden, N. J., Oct. 1. J. F. Taylor, of Sault Ste. Marie, who has been vice-president and practically general manager of the company there, has been made president. Mr. Drummond has not been in good health for some time.

W. K. Whigham, of London, has been made chairman of the board of the Lake Superior Corporation, and the other officers elected are: Henry Coppell and W. C. Franz, vice-presidents; Thomas Gibson, secretary; Alexander Taylor, assistant secretary, and A. H. Chitty, treasurer. The directors include, besides the officers, Frederick McOwen, of Philadelphia; John T. Terry and Joseph S. Dale, of New York; W. E. Stavert and D. C. Newton, Montreal, and James Hawson, of Sault Ste. Marie, Ontario.

OBITUARY

Henry B. Lupton, vice-president of the Oliver Iron & Steel Co., Pittsburgh, died at his home in that city Oct. 9. He was born in Cincinnati Dec. 23, 1849. Mr. Lupton was one of the best known men in the iron and steel trade in the Pittsburgh district.

T. Frame Thomson died from an accidental injury at his home near London, England, Sept. 30. He was 46 years old and had been engaged in engineering work in England and South America as well as in this country. For seven years past he had been chairman of the board of the Otis Steel Co., of Cleveland, Ohio.

Nathaniel Baxter, Jr., died at Nashville, Tenn., Sept. 29, aged about 73 years. He was a lawyer and banker and took a prominent part in the early movement to build up the iron industry in the South. He was president of the Tennessee Coal, Iron & R.R. Co. from 1883 to about 1890. He retired from business several years ago.

William J. Isaacson, of Cincinnati, died at Los Angeles, Calif., Sept. 13, aged 65 years. He was born in Norway, but came to this country when a boy. He was engaged in the iron and tinplate business, and for 21 years was managing director of the Dayton Coal & Iron Co., at Dayton, Tenn. In 1906 he retired on account of ill health.

Dr. Rudolph Diesel, well known as a profound student of thermodynamics and the inventor of the Diesel engine, was lost overboard from a steamer on the night of Sept. 29, while on his way from Antwerp to London to attend a meeting of representatives of the various Diesel engine-manufacturing companies. He was last seen walking on the deck in the evening, and is supposed to have fallen overboard accidentally. A recent dispatch from London reports that he was heavily in debt, though it was believed that he had received large sums for his engine patents.

SOCIETIES

Mining and Metallurgical Society of America—A meeting of the Philadelphia section will be held at the Engineers' Club, Philadelphia, on Monday, Oct. 20, at 8 p.m., the subject of discussion being the report of the Committee on Standardization recently published.

The New York section will hold a meeting on Oct. 23, at the Engineers' Club, New York, at 8 p.m. at which the subject of discussion will be the hydrometallurgy of copper.

Pennsylvania Industrial Welfare and Efficiency Conference—This meeting has been called by the Pennsylvania Department of Labor and Industry, and will be held, under the auspices of the Engineers' Society of Pennsylvania, at Harrisburg, Penn., Oct. 28-30. The Conference is of a strictly business character, to be attended by representatives of the industries and others interested. The work to be done is laid out about as follows: The first day, according to the provisional program, is given up to a general presentation of the subject, and to a study of what a number of the most interested state departments can do for the industries, including information as to how the service can be best obtained by those desiring it. The second day is devoted more specifically to labor conditions and their improvement, from the

standpoint of both employer and employee. The third day is used in a study of accidents and fires, and their prevention. Preliminary correspondence indicates that the conference will be attended by many prominent representatives of the most important industries of the State, and already sufficient specific indications of a desire to coöperate have been given to insure large success. In addition to individual establishments, many strong associations, representing all phases of industry are lending a cordial helping hand toward promoting the results sought.

INDUSTRIAL NEWS

The Mount Morgan Gold Mining Co., Queensland, Australia, is increasing the capacity of its timber-framing plant and has ordered another single-end timber-framing machine from the Denver Engineering Works Co., Denver, Colo.

The Compagnie d'Enterprises de Lavage des Minerais has transferred to F. & H. Dallemagne, of Chichy, France, all business connected with its patents for the mechanical preparation of minerals; also the operation of the plants at Clichy, France, and Pasajes, Spain.

The S. Flory Manufacturing Co., at Bangor, Penn., has completed temporary buildings in place of those recently destroyed by fire, and has them fully stocked with improved machinery for the manufacture of stationary and hoisting engines, boilers, slate saws, planers, etc. Permanent buildings are to be erected at once.

The Victor M. Braschi Machinery Co., Inc., has been organized, with Victor M. Braschi, president and treasurer; Alfonso Mendozo secretary. The new company has taken over the business formerly conducted in Mexico under the name of Victor M. Braschi. In addition to its offices in the City of Mexico the company has opened an office at 121 San Francisco St., El Paso, Texas, under charge of Carroll Helmick; also one at 80 Wall Street, New York, in charge of Gustavo Lobo. The company will continue to act as agent for a number of prominent manufacturers of mining machinery in the United States.

General Electric Co., Schenectady, N. Y., report the following orders recently received: The Matthiessen & Hegeler Zinc Co., La Salle, Ill., two 937 kv-a. Curtis turbo-generator Co., Calumet, Mich., of seven motors ranging from 15 hp. to 1250 hp., a 7-kw. turbo-generator set, an 8-kw. generator, one 7.5 kv-a. and three 15 kv-a. transformers, switchboard and accessories; the Montreal Mining Co., Garley, Wis., a 100-kw. two-unit three bearing motor-generator set and switchboard, and four 4-ton and two 6-ton electric mining locomotives; the Bethlehem Chile Iron Mines Co., South Bethlehem, Penn., a 215 kv-a. alternating current generator with 7-kw. exciter, nine transformers ranging from 10 hp. to 75 hp., switchboard panel and accessories; the Alaska Treadwell Gold Mining Co., Seattle, Wash., a 225-kv-a. alternating current generator and switchboard; the Arizona Copper Co., Clifton, Ariz., two 10-hp. two 50-hp., four 75-hp., and two 100-hp. motors with compensators and switches; the Carr Mines Co., Central City, Colo., two 50 kv-a. transformers, a 75-hp. motor and accessories; the Tierney Mining Co., Stone, Pike Co., Ky., a 300 kw. generator and switchboard.

TRADE CATALOGS

Chicago Pneumatic Tool Co., Fisher Building, Chicago, Ill. Hand drills and portable compressors. Illus., 16 pp., 6x9 in.

Sullivan Machinery Co., Peoples Gas Building, Chicago, Ill., Bulletin 66-H. Hyspeed and Liteweight Drill, Ill., 56 pp., 6x9 in.

Orenstein-Arthur Koppel Co., Koppel, Penn. Catalog No. 900. Portable and industrial railways, dump cars, buckets, locomotives, etc. Illus., 84 pp., 8½x11 in.

Ingersoll-Rand Co., 11 Broadway, New York. Bulletin, Form No. 8011. "Little David" riveting hammers. Illus., 8 pp., 6x9 in. Booklet, Form No. 632. Calyx core drills. Illustrated, 3½x5½ in.

The Laclede-Christy Clay Products Co. has issued a booklet, Laclede-Christy Fire Brick Uses and Practices for which Adapted. Illus.; 10 pp. 3½x6½ in. This booklet contains much valuable information and tables, and can be taken up by the practical everyday user of firebrick and followed with profit.

NEW PATENTS

COPPER ALLOY. William F. Nolan, St. Paul, Minn. (U. S. No. 1,074,285; Sept. 30, 1913.)

TUNNELING MACHINE. Norman Ebbley, Wallace, Idaho. (U. S. No. 1,075,027; Oct. 7, 1913.)

AMALGAMATOR. Lloyd Oscar Crocker, Beatrice, Neb. (U. S. No. 1,074,410; Sept. 30, 1913.)

CRUCIBLE FURNACE. Hans Koch, Dietikon, Zurich, Switzerland. (U. S. No. 1,073,912; Sept. 23, 1913.)

INGOTS—Apparatus for Manufacturing Ingots. William H. Connell, Pittsburgh, Penn. (U. S. No. 1,074,251; Sept. 30, 1913.)

SEPARATOR—Electromagnetic Ore Separator. Georg Rietkötter, Hagen, Germany. (U. S. No. 1,074,068; Sept. 23, 1913.)

ORE REDUCTION—Improvements Relating to the Reduction of Ores. E. R. Sutcliffe, Leigh, Eng. (Brit. No. 17,935 of 1912.)

ROASTING—An Improved Furnace for Roasting Ores or Other Materials. J. Socignet, Paris, France. (Brit. No. 146 of 1913.)

INGOTS—Manufacture of Ingots. William H. Connell, Pittsburgh, Penn. (U. S. Nos. 1,074,248, and 1,074,249; Sept. 30, 1913.)

LEACHING—Method of Treating Ores and the Like. Niels C. Christensen, Jr., Salt Lake City, Utah. (U. S. 1,075,011; Oct. 7, 1913.)

MELTING FURNACES—Improvements in Crucible and Melting-Pot Furnaces. L. F. Tooth, London, Eng. (Brit. No. 8474 of 1913.)

FLUME. Robert J. Johnson, Sheridan, Wyo., assignor to Sheridan Iron Works Sheridan, Wyo. (U. S. No. 1,073,857; Sept. 23, 1913.)

SEPARATION—Method and Apparatus for Magnetic Separation. Oscar Alfred Zander, Stockholm, Sweden. (U. S. No. 1,074,999; Oct. 7, 1913.)

SEPARATOR—An Improved Magnetic Separator. Fried Krupp Akt. Grusonwerk, Magdeburg-Buckau, Germany. (Brit. No. 4595 of 1913.)

CASTINGS—Method of Making Sound Castings. Frank D. Carney and Lewis B. Lindemuth, Steelton, Penn. (U. S. No. 1,073,735; Sept. 23, 1913.)

MINE-CAR WHEEL. Hiram A. Holzer, Pittsburgh, Kan., assignor to United Iron Works Co., Springfield, Mo. (U. S. No. 1,074,363; Sept. 30, 1913.)

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each. British patents are supplied at 40c. each.

ZINC—Process for the Recovery of Zinc Oxide from Zinkiferous Materials, Especially Slags. F. C. W. Timm, Hamburg, Germany. (Brit No. 10,376 of 1913.)

PULVERIZER—Apparatus for Pulverizing Coal and Other Materials. Claude Albemarle Bettington, London, England. (U. S. No. 1,074,040; Sept. 23, 1913.)

ZINC—Alloy of Zinc. Thomas Abraham Bayliss, Warwick, England, assignor of one-half to Byron George Clark, London, England. (U. S. No. 1,074,234; Sept. 30, 1913.)

DRILLS—Automatic Feed for Percussive Drills. Charles C. Hansen, Easton, Penn., assignor to Ingersoll-Rand Co., New York, N. Y. (U. S. No. 1,074,320; Sept. 30, 1913.)

ELECTRIC FURNACE. Johannes Hess, Vienna, Austria, assignor to the Firm of Bosnische Electricitats-Actiengesellschaft, Vienna, Austria. (U. S. No. 1,073,684; Sept. 23, 1913.)

FURNACES—Improvements in and Relating to Furnaces Particularly Applicable for Metal-Heating and Metallurgical Purposes. J. A. Hill, Sheffield, Eng. (Brit. No. 2489 of 1913.)

CASTING INGOTS. James Rossiter Hoyle and Arthur William Brearley, Sheffield, England, assignors to Thomas Firth & Sons, Ltd., Sheffield, England. (U. S. No. 1,073,988; Sept. 23, 1913.)

LEACHING—Apparatus for Extracting Metals from Ores. Henry S. MacKay, Riverside, Calif., assignor to MacKay Copper Process Co., Riverside, Calif. (U. S. No. 1,074,274; Sept. 30, 1913.)

IRON AND STEEL MANUFACTURE—Art of Making Iron and Steel. James R. Billings, Birmingham, Ala., assignor to Billings Process Co., Birmingham, Ala. (U. S. No. 1,073,587; Sept. 23, 1913.)

SEPARATION—Process of and Apparatus for Progressive Electrostatic Separation of Comminuted Materials. Henry M. Sutton, Walter L. Steele, and Edwin G. Steele, Dallas, Tex. (U. S. No. 1,073,645; Sept. 23, 1913.)

TIN AND GOLD RECOVERY—Improvements in or Relating to the Saving or Recovery of Tin, Gold and Other Ores, from Sand or Other Ore-Bearing Ground. T. H. Martyn, Quinta, Cornwall, Eng. (Brit. No. 19,346 of 1912.)

CRUSHING—Process for Crushing or Pulverizing Materials. Carl Dietz and Emil Gofferje, Leverkusen, near Cologne, Germany, assignors to Farbenfabriken vorm. Friedr. Bayer & Co., Elberfeld, Germany. (U. S. No. 1,074,847; Oct. 7, 1913.)

HARDENING—Case-Hardening Process for Articles of Iron, Steel and Steel Alloys. Frederico Giolitti, Turin, Italy, assignor to Societa Anomina Italiana Gio. Ansaldo Armstrong & Co., Genoa, Italy. (U. S. No. 1,074,114; Sept. 30, 1913.)

ZINC—Deposition of Metallic Salts from Solutions Containing Them. Harry Rees, Llansamlet, Glamorgan, Wales, and Henry Livingstone Sulman, London, England, assignors to the Metals Extraction Corporation, Ltd., London, England. (U. S. No. 1,074,203; Sept. 30, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Oct. 8

Forest Fires have destroyed a large amount of property in California in the last month, but the proportion of loss of mining property has been small. The only serious fire in the mining districts was at Forbestown, and that was exaggerated in the news item of last week. Later reports showed that the stores and post office were not burned, and besides the church the principal loss was confined to old unoccupied buildings. The Gold Bank hotel was an old building that had not been occupied for a long time. The hotel now being operated was not burned.

The Kennedy Extension-Argonaut Suit occupied the superior court, in the second week of the trial, with the testimony of R. S. Rainsford, manager, and W. J. Nettle, superintendent, of the Argonaut mine. Both in the direct- and cross-examination of these witnesses the attorneys have gone carefully and methodically into the many details of the physical conditions of the Argonaut and its relation to the Muldoon and the Jackson veins. The entire underground workings of the Argonaut were described by Mr. Rainsford, and with the aid of maps and the large model the several drifts, crosscuts and raises were exploited in practical minerlike language, shorn of unnecessary technical and scientific terms. The audience in the court room was composed of mine owners, managers, superintendents, foremen and miners. There has been no apparent contention between the parties to the action over the amount of ore mined by the Argonaut nor as to the demands of the Kennedy Extension. The whole case evidently rests on the question of apex. The Argonaut Mining Co. contends that the Jackson vein claimed by the Kennedy Extension does not exist, and that it has been working only on its own vein, the apex of which is claimed to be within the surface of the Argonaut ground. While the testimony of Mr. Rainsford is confined chiefly to the Argonaut the conclusions and deductions are in refutation of the findings of Dr. John W. Finch, witness for the plaintiff, but the evidence of Professor Lawson and Professor Wiley will be more in the nature of direct refutation of Doctor Finch and Professor George. There is practically no dispute over the physical condition of the several workings in both mines. The geological deductions will decide the case with but little, if any, differences on other matters to hamper findings of the court. The case will probably require two weeks more.

DENVER—Oct. 13

Pitchblende and Carnotite Deposits in Gilpin County, including the German, Wood, Belcher and Mitchell mines, have been purchased by Alfred du Pont, of Wilmington, Del., a millionaire philanthropist, and brother of the head of the powder manufacturing company. The mines are being operated by the German Uranium Gold Mining Co., and the ore is being stored until a sufficient quantity has been produced, when it is du Pont's intention to erect a concentrating and refining plant to produce radium. The radium will be turned over to American physicians for research work. It is stated that H. O. C. Thofern, of Paris, who is in Denver, and said to represent Madame Curie and the Radium Bank of Paris, tried to buy the output of the du Pont mines, but the offer was declined.

The Coal Miners' Strike is dragging along, injuring the business of the state, raising the price of coal, and bringing misery on the families of the strikers, with no apparent disposition on either side to yield. Violence is increasing, strikers are armed and are supplying themselves with ammunition. Hundreds of shots have been fired, the bullets perforating miners' dwellings and tents, and on Oct. 10 one man was shot dead and three others wounded at Ludlow, the hotbed of the strike. Operators and railroad companies are trying to get the governor to send the militia into the field to protect the nonunion workers, and the strike leaders, of course, are persuading him it is not necessary. The business men of Denver who attended a meeting of the Chamber of Commerce Oct. 8 passed a resolution asking Governor Ammons to call a special meeting of operators and workers, in an endeavor to reach a satisfactory settlement. So far the governor has failed to make any decisive move. The manager of the Denver & Salt Lake R.R. has given notice that owing to the short supply of engine coal, he will only run three passenger trains per week between Denver and Steamboat Springs.

BUTTE—Oct. 9

The Recent Washoe Shutdown for repairs did not throw the employees out of work, as the entire force was engaged in cleaning out the flues which had become badly choked by dust. The men received the same wages as were paid to them for their regular work.

The Bradley Process has not yet been abandoned by Thomas W. Lawson, although A. C. Burrage has withdrawn his financial backing. Lawson advanced the money necessary to pay off all debts and is now said to be putting up cash for the payment of the men left in charge of the plant. Bradley is in the East trying to raise money with which to continue his experiments.

An Experimental Leaching Plant of 80 tons capacity has been erected by the Anaconda company to test a new method for recovering copper and silver from the tailings of the concentrator at the Washoe smelting plant at Anaconda. Laboratory experiments have demonstrated that by treating 3000 tons of tailings per day an average of 10 lb. of copper and 5c. in silver can be recovered from one ton of the tailings at a cost of 70c. By crediting the silver, the cost of extracting the copper would be 6.5c. per lb. There are over 16,000,000 tons of tailings on the dump, and this amount is being increased by about 8000 tons daily. If the 80-ton plant confirms the results of the laboratory work, a 3000-ton plant will probably be erected.

Pilot Butte has been Enjoined by the Anaconda company after vainly trying to avoid bringing suit. The injunction is to prevent Pilot Butte from mining on a rich vein, which the Anaconda company opened in the Pilot, and from which it has been shipping ore for two weeks. The Anaconda company lays claim to the vein, saying it apexes in the Emily claim, south of and adjoining the Pilot. The Anaconda company had requested the Pilot Butte to cease mining and drive a crosscut between the 1300 and 1800 levels to determine whether or not the vein upon which mining is being done on the 2000 and opened on the 1800, is the same vein found by the Pilot on the 1300, but the Pilot Butte company declined to do that work, acting on the advice of its attorneys. Then the Anaconda brought the suit and stopped mining on the vein in question. The controversy involves several interesting questions, including the question of apex in which the side lines of the Pilot claim become the end lines; the question of a junction of veins and of prior location. Officers and attorneys for the Anaconda expressed regret over the necessity of bringing suit. The temporary injunction will simply preserve the orebodies in dispute until the controversy is finally settled, and will not prevent the Pilot-Butte company from working other veins.

SALT LAKE CITY—Oct. 9

Three Dividends Paid in September by Utah mines aggregated $1,234,496. These were the Bingham-New Haven, with $22,869; the Grand Central, with $25,000; and the Utah Copper with $1,186,627.

Utah Copper has made a new high record in handling and shipping 30,000 tons of ore from the mine to the concentrators at Garfield. This is 1000 tons more than the highest day's output in September. The average has been from 21,000 to 22,000 tons a day.

Ore and Bullion Settlements in Salt Lake during the last two weeks have been the heaviest in more than three years. For the week ended Oct. 4 the ore receipts at one bank amounted to $814,000 and the bullion shipments to $715,000, or a total of $1,529,000. These figures include returns from one only of the three smelters in the valley.

CALUMET—Oct. 11

The Injunction Dissolution Has Been Suspended by the supreme court, and the injunction is now in effect as originally issued by Judge O'Brien Sept. 20, with the exception that peaceful parades and meetings are allowed the strikers, and Nov. 4 has been set by the supreme court as the date on which Circuit Judge O'Brien is to show cause why a writ

of mandamus should not be issued to compel him to vacate his order of Sept. 29 dissolving the injunction. Lawlessness and rioting prevailed throughout the district this last week resulting in the killing of a deputy sheriff and a striker at the Isle Royale mine, south of Houghton, early Wednesday morning. James Pollock, the deputy, was attacked by a party of 10 or 12 strikers or strike sympathizers and was cruelly beaten and shot in the head; he died one hour after he was found. In the mêlée, a striker was shot in the stomach, which proved fatal. Several arrests have been made and the civil authorities have secured confessions from two of the men implicated in the fracas, and so have the case well in hand. Early in the week, Guy Wilkins, assistant supply clerk at the Ahmeek mine, was shot at from ambush and slightly wounded while on the way to the mine. Conditions throughout the district are decidedly strained and serious trouble is momentarily looked for. The strikers are holding parades at the various locations early in the mornings and the men assemble in groups, prior to the starting of these parades along the roads and streets that the men going to and coming from work traverse, and are only keeping within the restraining order, so that an outbreak may occur at any time.

HOUGHTON—Oct. 9

Additions to the Working Forces at all of the mines have been made this week. The Calumet & Hecla now works all of its shafts one shift, and four of the shafts were started on the night shift this week. The rock tonnage is between 4000 and 5000 daily at present, about half of normal. However, it is practically certain that the output of copper for the month of October will be closer to two-thirds of normal than half, for the reason that the richer stopes in the conglomerate lode are being drawn on to offset, as much as possible, the smaller rock tonnage. This week the Calumet & Hecla commenced to import men, one party coming from Butte and another from Lead, S. D. These men came to Calumet understanding the conditions. Most of them are men who formerly worked in the Calumet & Hecla mine and who went to the Western camps some years ago. They are returning in the face of the strike conditions and express themselves as glad to get back to Calumet. Many of the miners regularly employed at outlying mines but afraid to go to work at these mines because of the danger entailed to their lives and to their families are now working as trammers in the Calumet & Hecla, pending a more settled condition. The Quincy mine now is sending down about one-third normal output of rock, and the same condition prevails at the various Copper Range Consolidated mines, namely, the Champion, Trimountain and Baltic. At the South Kearsarge, the Osceola and the North Kearsarge mines, at Allouez and at Centennial a partial resumption of operations has been brought about and the exploratory properties are continuing their work as if nothing had happened.

MARQUETTE—Oct. 13

The Arctic vs. Cleveland-Cliffs Case will come before Judge Clarence Sessions sitting in the United States court at Grand Rapids, Nov. 17, and one of the most important litigations that have arisen in the Lake Superior region will be argued. The lease of the Regent group of mines at Negaunee, Marquette range, to the Oliver Iron Mining Co. by the Arctic company, the owner of the fee, is the matter in litigation. As an outcome of previous court proceedings, the master appointed for the purpose has found damages of $900,000 against the Cleveland-Cliffs company, a sum approximating the amount claimed by the plaintiff corporation. The defendant company will seek a reduction of these damages, and it is expected that, if the master's finding is upheld by Judge Sessions, the case will be appealed at Cincinnati. The $900,000 found for the Arctic company by the master is said to be the largest finding of damages ever returned in Michigan. But if this finding is finally sustained, the Cleveland-Cliffs company will be a loser by only one-half the amount, for it holds the stock of the Arctic company equally with the E. N. Breitung interests of Marquette. The inception of the case dates back to February, 1904. W. G. Mather, of Cleveland, president of the Cleveland-Cliffs company, was a trustee of the Arctic company at the time the lease of the Regent lands to the Oliver company was granted, and when the Breitung interests, in behalf of the Arctic company, instituted the litigation it was claimed that under the provisions of the lease there were reserved to the Clevland-Cliffs company certain advantages which should have been enjoyed exclusively by the Arctic company. The case was not finally disposed of in district court until 1909, when Federal Judge Knappen found unreservedly for the Arctic company. The $900,000 damages represents the Arctic company's share of profits from the operation of the Regent mines in the period subsequent to the closing of the lease with the Oliver company, and is exclusive of the return of valuable securities and rights to the Arctic company. The case has been stubbornly fought throughout, and it is likely to be a matter of a year of two more before the case is adjusted.

JOPLIN—Oct. 11

Lawton, which has at last "arrived," belongs to that class of camp the development of which was due to the persistency of one man. In the case of Lawton the one man was Walter Ragland, former state mine inspector of Missouri and the manager for the Eastern Lead & Zinc Co., which has opened the camp and made it possible for other operators to enter it. On leaving the service of the state five years ago, Mr. Ragland took up the work of prospecting land at present embraced by the Lawton camp. The land had been mined in a desultory way many years before, but the heavy water conditions prevented extended development. Mr. Ragland drilled steadily for many months. The results of his drilling showed a mineral deposit covering an area at least one-quarter mile long and 200 ft. wide. In spite of the apparent richness of the deposit and its extent, many of the older operators scoffed at the idea of going "way over into Kansas to mine a water hole," but Mr. Ragland kept at it and finally with the assistance of his Eastern associates organized the Eastern Lead & Zinc Co. It was a mining venture that required more than the ordinary patience to achieve success, for it required many months of faithful pumping in the face of many discouragements to get the water under control so that the ground could even be entered much less mined. Even today the company maintains one of the largest pumping plants in the district and it is kept steadily at work night and day. Since the mine has been finally opened up it has been a consistent and heavy producer. Its long assured life and the richness of the ore have attracted other operators and today there are two other milling properties in the new camp with the certainty of others coming in before another half year. The Larkin Mining Co. has a mill about completed; the Lawton Mining Co. has just started the erection of a mill. The John Hall mill will be running soon, while Oakes & Church have a property which is nearing the stage for building a concentrator. A large number of prospect drills are busy in the camp, and some shaft sinking is planned for the autumn months. In character the new camp resembles both the old Badger and Oronogo camps. It resembles the Badger camp in its heavy water problems and in a certain way some of its ores. On the other hand, the Lawton camp bears a remarkable resemblance to Oronogo. In the first place it lies in a small side valley of Spring River just as Oronogo does with Center Creek. This side valley in both instances is of large dimensions widening out as it gets back from the main drainage lines and having in it large outliers of Pennsylvanian shales and sandstones. The ore appears to lie in close proximity to the line of contact between the shales and limestone and flint. The ores are also greatly disseminated and in this respect resemble the Oronogo ores.

COBALT—Oct. 11

The 7% Arsenic Limit on Cobalt ores imposed by the American Smelting & Refining Co. will put a number of properties under a serious handicap. A large proportion of the ores from this camp carry in excess of 7% arsenic and the mines are now faced with the problem of marketing their ores. The majority of the ores shipped to the States were sent to the American Smelting & Refining Co. smelting works at Denver and Perth Amboy and to the Pennsylvania plant at Carnegie. The Canadian works are located at Thorold. Deloro, Copper Cliff and Orillia. During the last year, however, the Pennsylvania and Copper Cliff plants have been closed down and the Orillia plant was destroyed by fire. The other two Canadian plants have a limited capacity, and the Deloro plant which is controlled by M. J. O'Brien gives preference to the ores from the O'Brien mine in Cobalt and the Miller Lake-O'Brien mine in Gowganda, while the Thorold plant which is owned by the Coniagas company, has a capacity not much in excess of the requirements of the mine. It is understood that the Orillia plant will be rebuilt, and while this will somewhat relieve the situation, it will not be able to take care of all the excess ores. It is also believed that a market can be developed in Saxony, where there are plants for the treatment of ores similar to those of Cobalt and which have been running at reduced capacity on account of the failure of local ores. There is also some talk of erecting a customs plant at Cobalt, similar to those in operation at the Nipissing and Buffalo mines, where the high-grade ores are treated by combined amalgamation and cyanidation, with results more satisfactory than can be obtained at the smelters. The output is in the form of silver bullion and the cobalt residues find a ready market.

THE MINING NEWS

ALASKA

DIGGINGS ON SULLIVAN CREEK in the Hot Springs district are turning out rich, a recent cleanup after a short run netting $20,000. About 200 men are working on this creek.

SOLOMAN HAS BEEN DESTROYED. The storm that did much damage at Nome wrecked every building in the settlement, which had a population of 300.

IN THE KANTISHNA DISTRICT, via Fairbanks, Peter Lesh, who recently purchased claim No. 8 Above, found a 45-oz. nugget. There have been many forest fires in the country adjacent to the Kantishna River, but comparatively little damage has resulted.

IN THE CIRCLE DISTRICT, Deadwood P. O., rains in August permitted many of the small operators, who had closed down from lack of water, to resume operations. It is reported that Lamb & Co., on Mammoth, are to close down. The Elmer dredge has had many misfortunes during the summer, a breakdown in August necessitating a trip to Fairbanks for repairs.

TOLOVANA MINING CO. (Fairbanks)—Arrivals from Willow Creek state that a vein has recently been cut parallel to the old tunnel. A shaft is being sunk to determine the dip of the vein.

NEWSBOY (Cleary)—Sufficient water was available during most of August for the mill to be operated 24 hr. per day. Good ore has now been developed on three levels, the 100-, 150- and the 215-ft. and prospecting on the 315-ft. level is giving encouraging returns.

HADLEY (Ketchikan)—These properties have been taken over by the Granby Consolidated company, and development work will be started next spring. The ore will be shipped to Grand Forks. The Hadley mines have been involved in bankruptcy proceedings for several years.

VAN CURLER'S BAR (Fairbanks)—High water in the upper Chena River during the latter part of August destroyed a portion of the 400-ft. dam, flooding the workings and carrying away flume, sluice boxes and tools, with a total loss of $10,000. It is understood that the dam will not be rebuilt this season.

CRITES & FELDMAN (Meehan, via Fairbanks)—A shipment of 45 tons of ore was made from a fractional claim near the Helen S. Development work on the Helen S. has disclosed a comparatively large body of excellent ore, and tunnels are now being driven on some adjacent claims, which are owned by Crites and Feldman.

ARIZONA

Maricopa County

MESA GOLD MINING & MILLING CO. (Mesa)—A new hoist and other mining equipment has recently been installed.

VULTURE (Wickenburg)—The mill is running steadily, and regular shipments of concentrates are being sent to the smelter at El Paso. An abundant water supply has recently been obtained near the mine.

EUREKA (Walker)—The test run on Eureka ores recently made at the Poland mill proved highly satisfactory. The resulting car of concentrates was shipped to the Copper Queen works at Douglas. Development has been resumed in the mine and the mill will be overhauled and put into shape for continuous work.

Mohave County

WALKOVER (Kingman)—This property, near the Copper Giant, has recently been bonded. It is understood that development work will be commenced immediately.

KINGMAN COPPER CO. (Mineral Park)—The drilling operations of this company at Mineral Park have been discontinued and a drift is now being driven on one of the large veins.

TELLURIDE MINING CO. (Oatman)—Work has been resumed. The shaft is now 200 ft. in depth and is being sunk to the 300-ft. level. The property adjoins the Black Eagle claim of the Tom Reed mine.

ARIZONA-SOUTHWESTERN COPPER CO. (Yucca)—This company has received two of the new Saurer 6½-ton trucks recently ordered. The new mill is completed and has been tried out successfully since the repairs to the foundations of the crusher and tables were made. The new hoist is in operation and the sinking of the shaft below the present level will soon be started.

COPPER GIANT (Kingman)—The station has been cut at the 300-ft. level of this mine, and drifts are being driven in each direction along the vein. In places on this level, the orebody is 8 ft. wide and assays 25% copper. Ore is being piled on the dump preparatory to better shipping facilities being provided. At present, the ore that is shipped, is hauled to Hackberry and there loaded for shipment to Jerome. A siding is being put in at Valentine on the Santa Fé R.R., which is only about four miles from the mine. The success attending the work of the Clark interests on this property is stimulating activity in mining in the whole Chloride district.

Pima County

CABABI MINING CO.—Work has been resumed on the property formerly known as the Picacho group.

SAN XAVIER (Tucson)—The Empire Zinc Co. is developing the copper portion of its holdings, opening up a good grade of copper ore.

Pinal County

RAY-ARIZONA (Kelvin)—The churn drill hole is now down 580 ft. It is reported that the company will soon begin work on its main shaft.

KELVIN-SULTANA (Kelvin)—The winze from the 300-ft. level on the No. 2 vein is down 15 ft. and shows 3 ft. of 8% copper ore. In the east drift on the same level and vein a shoot of 4% ore 6 ft. wide has been opened for 30 ft. along the strike. Preparations are under way to resume sinking the shaft. The next station will be cut at the 500-ft. level.

Santa Cruz County

ELEPHANTS HEAD—Development work has been reduced pending the purchase of new mining equipment.

ANNA BELL (Patagonia)—The first carload of ore from this mine in the Mowry district has been shipped by O. H. Weaver and H. B. Briggs who recently leased the property. The ore is valued at $54 per ton.

CONNECTICUT (Patagonia)—Hogan & McCutcheon, lessees, have shipped another car of ore. Tunneling is being continued, with about 100 ft. to be driven to connect with the old winze, which will open up 400-ft. backs for stoping.

Yavapai County

HUMBOLDT CONSOLIDATED (Big Bug)—The shaft has reached a depth of 200-ft. and drifting has been begun on the 100-ft. level. As the shaft is deepened the force will be increased and shipments will be made.

OCTAVE (Congress)—The company has executed a trust deed to the International Trust Co. of Massachusetts to secure a bond issue up to the sum of $500,000. This is the initial step in the resumption of operations at the property.

WYMAZONA (Prescott)—A Humphreys mill has been installed, which is expected to treat from 8 to 12 tons per 24 hr. This is the first mill of its kind to be installed in the state; a second has been shipped to some property in the southern part of the state.

Yuma County

SUNSET (Harrisburg)—The Sunset, Central and Copper Belt groups, owned by J. A. Reid and John Devine, were sold recently. The new owners plan to begin work in November.

LA FORTUNA (Yuma)—T. C. Woodward and B. Keever, who recently acquired this old mine, have 50 men at work cleaning out the old workings and retimbering. Some development work has been in progress and an important new strike is reported.

TREGO PLACER (Swansea)—Recently R. M. Stene, vice-president of the Centennial Mining Co., examined and negotiated for 640 acres of placer ground about 45 miles southeast of Bouse. This ground has been worked by dry-placer methods intermittently and on a small scale for several years. Stene expects to install a plant of 500 tons daily capacity the principal feature of which will be the Stebbens dry-concentrator.

ARKANSAS

Marion County

PHILADELPHIA (Yellville)—J. T. McCarty, a lessee on this property, expects to begin operations in the near future.

CANE SPRINGS (Yellville)—Henry Hurd started work at this property Sept. 25. A large quantity of carbonate ore is said to be in sight.

CALIFORNIA

Amador County

CENTRAL EUREKA (Sutter Creek)—Sinking is continuing to a depth of 2800-ft., where a new level will be opened, making two new levels below the lowest place at which ore was extracted up to the first part of this year.

BUNKER HILL (Amador City)—Sinking has been resumed and the shaft deepened to 2350 ft. A new level will be opened at this depth, making two levels below the 1950-ft. station which is the present lowest working level. The vein at the bottom is wide and the ore is of good milling grade.

Calaveras County

ANGELS (Angels Camp)—It is reported that orders were received from J. V. Coleman, owner, to reduce the number of men employed. That this is an indication of a possible sale of the mine has not been confirmed.

Kern County

WINDY (Randsburg)—The ground adjoining this mine has been leased by Watchman Bros. and Robert Tait.

GOODHOPE (Randsburg)—A recent 14-day run of the mill produced 179 oz. of bullion, from 68 tons of ore, that averaged $42 per ton. The tailing assayed $3 per ton.

Modoc County

HESS (Alturus)—Bullion worth $900 was recently shipped. It is reported that the new mill will now be operated regularly.

Nevada County

DAYING (Hills Flat)—Recent development of high-grade ore at a depth of 20 ft. in the shaft has encouraged the owners to install a steam hoist.

EAGLE BIRD (Maybert)—The mine has been bonded to the Eagle Bird Mining Co., E. C. Klinker manager. A ¾-mile flume is being built to furnish water for milling and power. Lumber is also being cut at the company's sawmill for housing the 10-stamp mill that is to be built. This mine is an old producer that has been idle for a long time. The 800-ft. shaft is filled with water to within 50 ft. of the collar. The water will be pumped by steam pumps refitted for air. The shaft will be deepened. The present equipment consists of a hoist and air compressor. The 30-stamp mill operated by the former operators was destroyed by fire.

San Diego County

MONTEZUMA (Warner Springs)—The shaft house was burned and some of the machinery was damaged by fire and explosion resulting from lightning striking and exploding a box of dynamite, a barrel of gasoline and a barrel of kerosene. The loss, estimated at $15,000, included damage done to the compressor pumps and ore bins. The plant will be rebuilt.

San Luis Obispo County

OCEANIC QUICKSILVER (Cambria)—Murray Innes has purchased this property at a price said to be $20,000. The mine was worked and produced 7400 flasks of quicksilver between 1876 and 1879, and was idle until 1903, when a Scott furnace was installed. It has been operated irregularly since then. It is reported that Mr. Innes will reopen and operate the mine.

Sierra County

AT BRANDY CITY, after a long season during which a large amount of ground was worked, the hydraulic mines are operating with a smaller force until autumn rains shall replenish the supply of water.

YOUNG AMERICA (Downieville)—A plant for working the mill tailings has been installed by Charles Crooks and associates, who will operate throughout the coming winter.

SLEIGHVILLE HOUSE (Downieville)—This property owned by Thomas Rose and R. St. Clair has been bonded to a company that is at work opening up the gravel on a large scale; good prospects are being obtained.

ALHAMBRA—(Downieville)—A big vein, showing ore of good grade, has been disclosed at this Jim Crow Cañon property, and a 20-hp. Rix compressor, with machine drills and accessories, have been installed for development. An assay office and other buildings are also to be erected.

LEE BROS. (Sierra City)—Extensive improvements are being made. A hoist house, blacksmith shop and other buildings are being erected, a 4000-ft. pipe line is being put in, and a 40-hp. boiler, engine, hoist and pump will be installed. The hoisting and pumping machinery will be convertible, so that either steam or electricity may be used. A new shaft will be sunk this winter to a depth of 400 ft., to prospect the big vein.

Siskiyou County

THE SALMON RIVER DISTRICT water season ended about Sept. 1. It is reported that the miners have had a successful year and that a large amount of gold has been taken out from both placer and quartz mines.

COLORADO

Clear Creek County

ONEIDA (Freeland)—A streak of smelting ore has been opened in the breast of the lower tunnel. This is probably the downward extension of the oreshoot opened in the upper levels.

TWO KINGS (Idaho Springs)—This company, operating in Hukill Gulch, recently installed a pipe line from its property to the compressor plant of the Stanley Mines Co. and will purchase compressed-air power for the operation of its machine drills and pump.

UNITED FREELAND DEVELOPMENT & TUNNEL CO. (Idaho Springs)—This is a new company formed to complete the McLelland tunnel on Lode Mountain near Dumont. This tunnel is already in over a mile, and will be continued to the intersection of the one time famous Freeland vein.

LUCANIA TUNNEL & MINES CO. (Idaho Springs)—The property of this company, on Bellevue Mountain, has been sold at public sale to satisfy a judgment amounting to $48,404. The property was bought in by Samuel Sternberger for $51,500, which includes the amount of the judgment and cost of suit. The crosscut tunnel is 6500 ft. long and has its portal on Fall River. Several promising veins have been intersected and will be further developed in the near future by the new owner of the property.

Lake County

THE DEMAND FOR ZINC ORES is on the increase. The Empire Zinc Co. is buying heavily, and taking 22% ore; until quite lately 25% was the lowest grade it would accept.

San Juan Region

BROWN MOUNTAIN (Ouray)—The furnace is now running smoothly. A mishap occurred after starting. The roof caught fire, making it necessary to shut off the blower.

MINNEQUA MINING & REDUCTION CO. (Denver)—This company has leased promising ground and is producing 300 to 400 tons of high-grade lead-zinc ore monthly. About seven tons of zinc concentrate is produced daily, assaying 50% zinc, 5 to 6% lead, 2½ oz. silver, less than 3% lime and 3% iron.

Teller County

DANTE (Cripple Creek)—The Gaylord mill on this property treated in September 1300 tons of $4 ore at a profit.

VINDICATOR (Cripple Creek)—The regular quarterly dividend amounting to $45,000 has been declared, making a total of $2,767,500 received by the stockholders.

IDAHO

Cœur d'Alene District

BIG ELK (Taft)—Good copper ore was struck at this property, when the crosscut tunnel encountered the vein. More men have been put on and work will continue throughout the winter.

GREEN HILL-CLEVELAND (Mace)—The débris caused by the wrecking of the hoisting plant about two months ago has been cleared away and within a day or two it is expected that the work of replacing the hoist can begin.

NATIONAL (Mullan)—The new 500-ton mill will be under cover within 30 days. The concrete foundations for the structure have been completed and work has begun on the framing. The track for the electric-haulage system between the mine and mill is being laid and the transportation equipment will be installed by the time the concentrator is ready to operate, which will be about Jan. 1, provided there are no unforeseen delays.

MICHIGAN

Iron

JUDSON MINING CO. (Crystal Falls)—This new company is sinking an inclined shaft on its property in the Mastodon field. Foundations for an engine house and a boiler house have been completed. Two 150-hp. return-tubular boilers have been installed and space allowed for two more. A 2000-cu.ft. Ingersoll-Rand air compressor and a Lake Shore Engine Works hoist have been purchased. The Foster Construction Co., of Milwaukee, will build the engine house. Machine shop, change house, warehouse and office will be erected later.

IMPERIAL (Michigamme)—The Cleveland-Cliffs Iron Co. has succeeded in selling the ore that has been in stock at this mine for several years, and the steam shovel ceased work last week. The little ore remaining will be loaded by hand and sent out this year. The Imperial ore is limonite and does not sell readily in the market. A number of improvements have been made at the property during the last year and a half, and it will be well equipped for mining when orders are given to resume operations. It is believed that work will be started around the first of the year if there are any inquiries for the ore.

MINNESOTA

Cuyuna Range

BRAINERD-CUYUNA MINING CO. (Brainerd)—The shaft, within the city limits of Brainerd, is down 25 ft. Structural material is all assembled for the shaft.

ARMOUR NO. 1 (Crosby)—This shaft, which had ceased shipping and started to stock its output, has again resumed shipments at the rate of 1000 tons per day.

CUYUNA-MILLE LACS (Crosby)—The company has sold 10,000 tons of high-grade manganiferous iron ore to the Cleveland-Cliffs Iron Co. for delivery this season.

IRON MOUNTAIN (Iron Mountain)—First ore was raised from the new 3-compartment shaft the week ended Oct. 4. The Soo railroad is laying track to the property; product is manganiferous iron ore, but not high grade.

ROWE (Riverton)—Track gangs are now laying track into the property. Two standard Baldwin locomotives and 20 dump cars are at hand to serve the two steam shovels as soon as the tracks are in. Meantime, hydraulicking continues and will do so until freezing weather interferes.

CUYUNA-DULUTH IRON CO. (Ironton)—Underground connections have been made between the Ironton shaft of this company and the Armour No. 2 shaft. This will work to the advantage of both properties as it insures better ventilation and increased safey for the men. The company has put down 22 holes on lands which it owns near the Kennedy and it is reported that some manganese ore of good grade has been encountered.

Mesabi Range

ORE SHIPMENTS FOR SEPTEMBER over the Duluth, Missabe & Northern Ry. amounted to 1,938,823 tons against 1,652,735 in September, 1912; over the Iron Range R.R., 1,518,030 against 1,130,482 last September. For the season to Sept. 30, the Duluth, Missabe & Northern Ry. moved 9,830,726 tons compared with 7,729,187 last year; the Iron Range R.R. moved 8,194,738, last year 7,310,194 tons.

HULL-RUST (Hibbing)—It is estimated that close to 4,000,000 tons will be shipped this season to lower lake ports. It would be possible to push the work and get out more than that but the Oliver Iron Mining Co. is content to let the property run as it is, producing twice as much iron ore as any other Lake Superior property. There are about 300,000,000 tons of ore in sight.

OLIVER IRON MINING CO. (Chisholm)—A new property is being opened up between the Monroe and Shenango mines. The company has secured possession of 80 acres, which has an extensive ore deposit, being a continuation of the body on the Shenango. The shaft work will be started with in a few days and it will not require a great deal of time to get the mine in shape for a large production.

JORDAN (Chisholm)—After being abandoned for several years, this property will again be operated by Joseph Wilson and J. J. Gleason, of Eveleth. The property was formerly a combination of openpit and shaft, the ore being "milled." The new operators have drilled the property and located additional tonnage, which will be removed through a new shaft now going down. When abandoned the ore had apparently pinched out.

Vermilion Range

SECTION THIRTY (Ely)—Hoisting now is at the rate of 800 tons per day. A new shaft is contemplated, to increase the output to 1200 tons. Over 17,000 ft. of drifting has been done on the property to date.

MISSOURI-KANSAS-OKLAHOMA

Joplin District

IN THE SHERWOOD CAMP operations are being resumed after an idleness of two years. Charles Moore has started work at the Texas, a new producer, and W. C. Eyster, of Joplin, is opening one of the old producers. Mining was first begun in this camp in 1887, but a few years ago operations were abandoned.

E. G. DOANE & SON (Joplin, Mo.)—Several new silicate strikes have been made on the lease near Spring City.

VAILE MINING CO. (Joplin, Mo.)—This company has struck a 6-ft. vein of lead ore at a depth of 141 ft. A 20-acre lease is held. With the shaft sunk through the ore, drifting will begin.

POCATELLO (Thoms Station, Mo.)—The concentrator building has been completed and machinery is being installed. Operations are expected to begin within two weeks. Ore has been blocked out at a depth of 182 feet.

EASTERN LEAD & ZINC CO. (Lawton, Kan.)—Mark Hall, operating on a lease of this land, has purchased the Becker mill, situated in the south Carterville camp, and will have it removed to his property. Good ore is being mined, the deposit justifying a concentrator.

SOUTHSIDE LAND (Galena, Kan.)—Isley & Co. are working a good run of lead ore and a pay vein of zinc at the 186-ft. level. A. G. Peck and associates are encountering unusual zinc ore at a depth of 45 ft. Larger producers are the Hartford, Black Hills, Diplomat, Lockport, Squires, James Murphy and Rohrbaugh Bros.

SHOEMAKER TRACT (Joplin, Mo.)—D. Molloy, A. Raymond and others are opening a good prospect, which promises to rival the old Bumble Bee, one of the big producers of the Joplin camp a few years ago. Ore was found by drilling and the company will sink two shafts to prove the find. One shaft already is operated on the lease.

TEMAGAMI (Joplin, Mo.)—An underground tramway is to be built in order to work the orebody, which has been dipping gradually, making it difficult to reach the shaft with loaded tubs. The tramway will be 560 ft. long and on an incline. Loaded "cans" will be hoisted a distance of 20 or 30 ft. from a point near the heading and then placed on a car and carried to the bottom of the shaft by their own weight; from there they will be hoisted to the surface.

MONTANA

Butte District

CORBIN (Butte)—According to a report from Boston the company has made arrangements for temporary financing. A Boston house agreed to take the 60,000 shares on which the assessment of $1 is due, at a price that would net the company $1 per share.

BUTTE-MILWAUKEE (Butte)—Stockholders have received another communication from President C. W. Peters urging them to exchange their stock for that of the Butte-New York Copper Co. at 2½ shares for one. He says 92% of the stock has been exchanged.

ANACONDA (Butte)—The Washoe smelting plant, closed since Oct. 1 to permit repairs being made to the flues, has resumed operations. The Anaconda and other Butte companies paid miners for September at the rate of $3.75 per day, the average price of copper during the month having been a little less than 17c. per pound.

BOSTON & MONTANA DEVELOPMENT (Butte)—Surveyors in the field for the Butte, Wisdom & Pacific Ry., to be built by the Boston & Montana Development Co., have reached the mouth of the Wise River, above Dewey, Mont., and there diverted the work up the Wise River to the Elkhorn mining district, where the company owns about 40 claims, including several producing properties.

BERKELEY (Butte)—This mine of the Anaconda company, which has been closed for some time for repairs and to make the change from steam to compressed-air power, will resume operations about Nov. 1. Up to date the Anaconda company has equipped 10 of the larger hoists at its mines with air power; eight auxiliary engines have been similarly changed.

ALEX-SCOTT (Butte)—The shaft has reached a depth of 145 ft. below the 1900-ft. level and will be continued to the 2200-ft. level. A station will be cut on the 2000-ft. level this month and a crosscut started south to intersect the vein. Daily shipments of 150 to 200 tons of ore are being made to the East Butte smelting plant, of which about 50 tons is first class, averaging between 9% and 13% copper, and the remainder second class, carrying about 4½% copper. The expense of hoisting ore has been materially lessened by the new hoisting equipment by which hoisting is done with a double-deck cage. Good ore was recently encountered on the 1900-ft. level.

Granite County

ROYAL BASIN (Philipsburg)—At this property of the Royal Basin Mining & Milling Co., good copper and silver ore has been opened. The vein was encountered Sept. 28 in a crosscut tunnel being driven to open the mine at a depth of 800 ft. After drifting a few feet in ore of concentrating grade, a shoot of ore was encountered which assays 7½% copper and from 5 to 70 oz. silver.

EAST BROOKLYN—By a supreme court decision handed down at Helena, Oct. 6, R. S. Leveredge and P. F. Schur, lost a suit which they instituted some time ago against Thomas Hennessy and Timothy Connors to quiet title to a portion of the Brooklyn lode claim which conflicted with a prior location of the Speculator lode. In rendering the decision the court held that the law concerning the location of a claim requires that, taking the discovery shaft as the initial point, the boundaries must be so definitely located that they can be definitely traced, and that the declaratory statement must contain directions which will enable a person of reasonable intelligence to find the claim and run the lines. It was ascertained that the law was not fully followed in the location of the Speculator lode, and the defendants were allowed to remain in possession of the disputed territory.

NEVADA

Douglas County

LONGFELLOW (Gardnerville)—An oreshoot showing free gold was struck on the 100-ft. level recently.

Eureka County

NEVADA CENTRAL COPPER CO. (Palisade)—Active exploration work has been resumed after a shut-down of two months due to loss of the engine house by fire during last July.

Humboldt County

THE PRESENT PRODUCTION OF ROCHESTER is about 100 tons daily, assaying from $30 to $250. The population of the camp is about 700.

A NEW PLANT FOR THE CINNABAR DEPOSIT near Gold Banks, it is stated, will be built in the near future. The deposit is large and the ore is of good grade and can be mined from opencuts.

ROCHESTER WEAVER VS. ROCHESTER NUGGET—The trouble between these two companies, arising from the nonpayment of royalties by the defendant company, a lessee on the ground of the plaintiff, has been settled by compromise out of court.

SEVEN TROUGHS COALITION (Seven Troughs)—A Sullivan, type E, diamond drill has been installed, and the first work was done on the 800-ft. level. The drill will be used in prospecting for parallel veins, and for portions of the main vein which have been faulted.

Lyon County

McDONALD-BOULTER (Mason Pass)—The West End company, of Tonopah, has secured an extension of time on its lease on this property and development will be continued.

NEW YERINGTON (Yerington)—The 400-ft. level is being advanced as rapidly as possible, another shift having been put on for this purpose. A winze is being sunk in ore from the tunnel level.

NEVADA COPPER BELT R.R. (Mason)—Two new Packard auto trucks have been put on between Hudson and Aurora. A passenger auto and an auto truck will be put on the road from Yerington station to Yerington.

YERINGTON-BULLION (Yerington)—Leaching tests on ores from this property by the Foss International Ore Reduction Co., of San Francisco, have been satisfactory, a 95% extraction is reported as having been made.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Oct. 2, 1913, were as follows: From Mason Valley mine, 2237 tons; from Nevada-Douglas, 797 tons; from other mines, 1032; total, 4066, or a daily average of 581 tons. During the same week four cars of matte were shipped.

SMITH VALLEY MINES CO. (Smith Valley)—A branch line from the Pine Grove power line will be built, and complete electric equipment will be installed. It is reported that a six-mile branch from the Nevada Copper Belt R.R. will be built. Ore of good grade has been struck in the tunnel being driven to connect with the shaft.

Mineral County

EXCELSIOR MOUNTAIN MINING CO.—This property, 17 miles south of Hawthorne, has increased its force recently and is doing extensive development work. A power line extension from the Lucky Boy is contemplated.

BLUE LIGHT (Mina)—The owners of this property, after having a complete examination made, have decided to reopen it. In the past a considerable tonnage of copper ore assaying well in gold and silver was shipped.

Nye County

PLACER MINING AT ROUND MOUNTAIN has been discontinued for the winter on account of the shortage of water. These placers are among the most profitable now being worked in the state, some of the gravel assaying $5 per cubic yard.

SULLIVAN & LONN (Millett)—The new 10-stamp mill is operating steadily, and treating ore from the mine which assays $25. A shipment of bullion was made recently.

NEW MEXICO

Socorro County

OAKS (Mogollon)—A new winze has been started in tunnel "B" of the East End tunnel group and will be sunk 50 ft. and drifts will be driven from the bottom.

PACIFIC MINES CO. (Mogollon)—Drifts on the 240-ft. level are being advanced both north and south. This work recently encountered two oreshoots not exposed in upper levels.

LINCOLN MINING & DEVELOPMENT CO. (Mogollon)—The road to the property in Cooney has been rebuilt up the cañon and the new sinking pump will be delivered and installed as soon as possible.

MAUD MINING CO. (Mogollon)—The water line extending up Silver Creek, through Mogollon, about two miles from the mill, is being taken up and new pipe laid in many places. The compressor plant recently installed is giving satisfaction.

TREASURE MINING & REDUCTION CO. (Mogollon)—The electric hoist is being overhauled and other work done preparatory to placing a large crew in the mine. Some changes in the milling plant are contemplated. Power is obtained from the company's hydro-electric plant on Whitewater.

TENNESSEE

Polk County

TENNESSEE COPPER CO. (Copper Hill)—The remarkable gas conditions continue by virtue of the regular and systematic use of the ore beds recently described in the "Journal."

UTAH

Beaver County

MOSCOW (Star District)—During September, 12 cars of ore were marketed. Good progress is being made in the work between the 700- and 800-ft. levels, and the new three-compartment shaft is down over 40 ft. This shaft is to be sunk to the 1000-ft. level, and will connect with the workings from which ore is being extracted.

LEONORA MINING & MILLING CO. (Star District)—This property adjoins the Red Warrior, Moscow, Cedar-Talisman and Majestic. An examination has recently been made, and a report to stockholders states that the surface showings are as good or better than at the adjoining producing properties. A campaign of development has been outlined, including the sinking of a shaft to the 300-ft. level.

Juab County

SEPTEMBER SHIPMENTS FROM TINTIC amounted to 595 cars, or approximately 29,750 tons of ore. This output came from 26 shippers, and is slightly less than normal. The highest output of any month this year has been that of May amounting to 901 cars.

LEHI TINTIC—Operations are to be resumed.

IRON BLOSSOM (Silver City)—A meeting will be held Oct. 10, when the usual dividend is expected.

COLORADO (Silver City)—Milling ore has been developed below the old stopes and east and west of the main ore channel.

VICTORIA (Robinson)—The Eagle & Blue Bell Co. is said to have an option on this property, which expires in the near future. A strike was made recently on the 1200 level.

OPOHONGO (Mammoth)—About 350 ft. of drifting was done during August and September, in the tunnel. The objective point is the main vein, which, it is thought, will be cut in the next 200 ft.

TINTIC MINING & DEVELOPMENT (Mammoth)—Operations have been suspended for the time being at this property, which adjoins the Gold Chain, Opohongo, and Mammoth. Work has been done to a depth of 800 feet.

GRAND CENTRAL (Robinson)—Shipments have been suspended while the shaft is being retimbered between the 400-ft. level and the surface. The retimbering is expected to take about two weeks, after which production will be resumed. Much ore is reported to be in sight.

EAGLE & BLUE BELL (Eureka)—The annual meeting was held Oct. 4, and the old board of directors reëlected. During the last year dividends were started, and three were paid. The earnings for the first nine months were approximately $140,000. It is generally understood that this company's option on the Victoria expired Sept. 30, and a continuation was not granted.

Salt Lake County

SOUTH HECLA (Little Cottonwood)—Active development is being done at this property, and the raise from the Dwyer level will soon reach the No. 1 stope. This will greatly facilitate the handling of ores. Drifting is being done toward the old Wedge shaft, in promising ground.

BINGHAM MINES (Bingham)—This property, formerly the old Bingham Consolidated, was recently visited by eastern directors. Beside the Dalton & Lark, Brooklyn and Commercial mines in Bingham, the company owns 78% of the outstanding Eagle & Blue Bell stock, and has received a good share of the latter company's dividends.

CARDIFF (Big Cottonwood)—Progress is being made in the work on the lower tunnel. On Oct. 1, the face was in 1415 ft. This beyond the upper workings, and is about 300 ft. vertically under the old Prince tunnel. The quartzite-limestone contact is being followed. Ore is being mined from an 85-ft. winze on the level above. During the last year 600 tons of ore were shipped from the upper workings.

MONTANA-BINGHAM (Bingham)—The development and transportation tunnel being driven by this company is in over half of the proposed length, and progressing at the rate of three to five feet daily. The face is in porphyry, showing pyrite and some chalcopyrite. About 300 ft. of mineralized ground has been cut. The tunnel will prospect and eventually develop a part of the eastern section of the camp, including the Fortuna, Keystone, Conger and other ground.

WASHINGTON

Ferry County

KNOB HILL (Republic)—Regular daily shipments averaging 55 tons are being made to the San Poil mill.

HOPE—This company has a force of men breaking ore in the course of development, and is making occasional shipments.

BEN HUR (Republic)—The shaft is being sunk to the 600-ft. level, and about 1500 tons of ore are ready for shipment.

HALL CREEK (Meteor)—A power plant and concentrator with a capacity of 75 tons per day are being built at this property, and will be in operation soon.

Okanogan County

PRIZE (Oroville)—This mine, owned by the Ellemeham Operating & Development Co., has been equipped with electric power, and a 90-day test run will be made in the near future.

Spokane County

TUNGSTEN-KING—Operations at this mine have been resumed. A strike has been reported at the property of the Harrison-Beard company. Both properties are located about 10 miles north of Spokane. All of the tungsten properties in this locality are showing more activity than for some time past.

Stevens County

SECURITY COPPER (Chewelah)—Just as soon as the wagon road is completed, operations will begin.

WISCONSIN

Platteville District

WEST HILL (Platteville)—This prospect is showing up well and a concentrator will be built.

VINEGAR HILL (Strawbridge)—This company is drilling the Charles Smith land east of Strawbridge and also the Kennedy land at Vinegar Hill.

BIDDICK (Livingston)—Bock, Meyer & Brown have opened up a rich orebody on this land which appears to be a continuation of the Coker range at Livingston.

GREAT WESTERN (Galena)—A big run of heavy sheet jack has been opened up by shaft on the Brown land, formerly known as the Pittsburgh, four miles south of Galena. Pittsburgh men are interested in the property.

MARTIN (Benton)—The Vinegar Hill Zinc Co. has completed shaft sinking and the construction of a 150-ton mill on the Martin land one mile south of Benton; the Cottingham and Strawbridge adjoining, and embracing in all 300 acres, have been thoroughly proved by churn drill.

CANADA

British Columbia

BRITANNIA (Britannia Beach)—This company, which is installing a plant for the separation of its ore by a flotation process, has ordered more Hardinge mills therefor, which will make the present installation comprise nine mills.

Ontario

PEARL LAKE (Schumacher)—It is officially stated that the mill will not be built until next year.

MAPES JOHNSTON—A winding up order has been granted by the courts against this company, which is working a claim near Silver Lake in the Montreal River district.

SCHUMACHER (Timmins)—A new main working shaft is being made by a raise from the 100-ft. level of the old workings. The shaft will be timbered to the 100-ft. level and be sunk to 200 feet.

HOLLINGER (Timmins)—This mine has completed its first year as a dividend payer, 13 four-weekly disbursements having been paid, amounting in all to $1,170,000. Up to Aug. 17, $1,597,065 had been realized in profits.

HUDSON BAY (Cobalt)—The production for August amounted to $73,150. The holding company known as the Hudson Bay Mines, Ltd., has declared a dividend of 2½% which with the cash on hand, will permit the operating company to pay three dividends of 300%.

NIPISSING (Cobalt))—In crosscutting from No. 64 shaft at the 650-ft. level, the vein encountered is 16 in. wide, but carries low-grade ore as at the 440- and 270-ft. levels. An additional 250 ft. of sinking is to be done, making a total depth of the shaft of 900 ft. or the deepest in the camp. This work is of interest as being the first attempt to explore the Keewatin formation at depth.

McKINLEY-DARRAGH (Cobalt)—High-grade ore has been struck in the face of No. 40 vein at the 150-ft. level. The ore is stated to run 10,000 oz. per ton. It is too heavy to crush and is being hand-sorted. The vein was cut a month ago and the general average of the ore has been over 5000 oz. Vein 36 has shown improvement and a shoot of 2000-oz. ore is being developed. The production in August was 212,098 oz, of which 142,662 was from the Savage mine.

DOME (South Porcupine)—For the five months, April to August inclusive, 58,885 tons of ore were milled, giving a gross return of $519,666. The average value of the ore for the five months was $9.62 per ton and the average operating costs $3.86 per ton. During August, the average value of the ore was $6.31 per ton, which is about the grade the management expect to have to handle in the future. With the additional 40 stamps which are being installed, the costs should be reduced to about $3.50 per ton.

MEXICO

Durango

CIA MINERA DE PENOLES (Mapimi)—The mines at Ojuela and the smelting works at Mapimi were closed down about the first of October. With a few exceptions Americans and other foreigners have left the district. Rudolf Weniger, the assistant superintendent of mines, went to Torreon just before the exodus to arrange for the leaving of the foreigners. He was murdered somewhere between Torreon and Mapimi. Telegraphic inquiries from New York have elicited no details.

NICARAGUA

Pis Pis District

BONANZA (Bluefields or Cape Gracias)—This and several other nearby mines have been sold to the Canadian Agency, Ltd., of New York. The mine was discovered and operated up to the time of sale by Joe Lapierre. He operated a mill of eight or ten 3½-ft. Huntington mills, and a cyanide plant. Several years ago the property was examined for F. W. Bradley and associates, of San Francisco, but a question of legal rights of acquiring the extension of the orebody precluded a sale. The ore is in a hill and is mined by a system of adits and glory holes. While not much developed a good quantity of $9 gold ore was considered in sight with an enormous tonnage in prospect.

FRANCE

A COLLIERY DISASTER is reported to have occurred Oct. 14 in the south of France.

SPAIN

THE RAILROAD STRIKE has been renewed on the road of the Rio Tinto mines to Huelva. Later dispatches state that a general strike has been voted at Rio Tinto.

WALES

A COLLIERY EXPLOSION is reported to have killed many miners in the Universal mine at Senghenydd, 10 miles from Cardiff, Oct. 14.

THE MARKET REPORT

METAL MARKETS

NEW YORK—Oct. 15

The metal markets have not been active, but rather quiet. At the same time there are no signs of depression and the undertone is generally good.

Copper, Tin, Lead and Zinc

Copper—Consumers both in this country and Europe continue to hold aloof, but from all reports, they are busy and will soon have to replenish their depleted stocks. The statistical position of copper is so strong that the danger that any accidental reduction in production will create a scarcity of copper is ever present, on account of the exceedingly low stocks. In consequence of this, the principal producers have steadily maintained their asked price of 16⅞c., delivered, usual terms, being confident that the market will speedily come back to that figure. In the meanwhile dealers, traders, and the agencies having facilities for arbitrage transactions have accepted materially lower figures. The range of prices in the London standard market has permitted the cheap offering of refined copper and the covering of such sales by the purchase of raw material. During the last week electrolytic has been freely offered at 16⅜@16¼c., delivered, usual terms, and 16⅛c. was accepted on some business.

The situation in Lake copper remains the same as last week. Two or three of the small mines have a little to sell and occasional carloads are disposed of, but outside of them no one has this kind of copper except the Calumet & Hecla, which is taking care of its regular customers on private terms. This market is difficult to quote. The occasional carloads fetch about 16¾c. The C. & H. copper undoubtedly is billed higher. We quote this market at 16¾@17c. nominally.

At the close we quote electrolytic in cakes, ingots and wirebars at 16@16.10 cents.

Casting copper has again been rather pressed for sale. We quote 15.85@15.90c. as an average for the week.

The London standard market has been under pressure of bear selling and declined steadily, reaching £70 10s. for spot and three months on Tuesday, Oct. 14. On Wednesday, Oct. 15, the market reacted, and closes at £71 12s. 6d. for spot and £71 13s. 9d. for three months.

Speculative sentiment in copper is affected by the general feeling of caution and hesitancy which pervades the other speculative markets, and it is believed that if this feeling should change, the intrinsic strong position of the metal would again lead speculators to take hold, and that this might find immediate expression in the London standard market, which is comparatively low.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17½@18c., carload lots at mill.

Exports of copper from New York for the week were 7267 long tons. Our special correspondent gives the exports from Baltimore at 2957 tons for the week.

Tin—The market continued exceedingly dull. Efforts were made by domestic dealers to market quantities of tin by underquoting the London market to the extent of about¼c. per lb., without, however, attaining their object. Prices declined to a slight extent in the London market and became firmer again at the close, when they stand at £184 15s. for spot and £185 for three months, and about 40⅜c. for October tin here.

Messrs. Robertson & Bense report the receipts of tin ore and concentrates at Hamburg, Germany in September at 3230 tons, all from Bolivia.

Shipments of tin from the Straits in September were 5160 long tons. For the nine months ended Sept. 30 the total shipments were 40,440 tons in 1912, and 46,860 in 1913; an increase of 6420 tons.

Lead continues pressed for sale, and lower prices have again been accepted. For desilverized 4.50c. has been paid, which is still the price of the American Smelting & Refining Co., and sales of Missouri lead have been made at 4.45@4.47½c., but as early as Oct. 10 some tonnage business was placed at 4.40c. At the close we quote New York at 4.40@4.45c. and St. Louis at 4.25@4.30 cents.

The London market is somewhat lower, Spanish being quoted £19 17s. 6d., and English lead £1 higher.

Spelter—The market has been somewhat more active, due to the fact that consumers having held off some time, have now reached the point where they must again come into the market. The concessions offered to them by sellers have, moreover, been attractive. The demand that has manifested itself has not yet been large, and it has been freely met, but there is a rather more hopeful feeling. At the close spelter is quoted at 5.10@5.15c., St. Louis, and 5.25@5.30c., New York.

Good ordinary spelter at London is quoted £20 12s. 6d., and specials £21 17s. 6d. per ton.

Base price of zinc sheets is now $7.75 per 100 lb., f.o.b. Peru, Ill., less 8% discount. Extras and discounts unchanged.

The Mineral Point Zinc Co. has started its eighth block at Depue, Ill., giving seven blocks in operation, one of the old blocks being out for repairs.

DAILY PRICES OF METALS

NEW YORK

Oct.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
			*16¾	16.15		4.40	4.25	5.30	5.15
9	4.8550	60⅞	@17	@16.25	40½	@4.50	@4.35	@5.35	@5.20
			*16¾	16.10		4.40	4.25	5.25	5.10
10	4.8565	60⅞	@17	@16.20	40¼	@4.50	@4.35	@5.30	@5.15
			*16¾	16.05		4.40	4.25	5.25	5.10
11	4.8560	61¼	@17	@16.15	40¼	@4.50	@4.35	@5.30	@5.15
							4.25		5.10
13	.....	..	....	.....	...	.....	@4.35	.....	@5.15
			*16¾	16.00		4.40	4.25	5.25	5.10
14	4.8555	61⅜	@17	@16.10	40¼	@4.45	@4.30	@5.30	@5.15
			*16¾	16.00		4.40	4.25	5.25	5.10
15	4.8555	61¼	@17	@16.10	40⅜	@4.45	@4.30	@5.30	@5.15

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Oct.	Silver	Copper				Tin		Lead		Zinc	
		Spot									
		£ per Ton	Cts. per Lb.	3 Mos.	Best Sel'td	Spot	3 Mos.	£ per Ton	Cts. per Lb.	£ per Ton Ton	Cts. per Lb.
9	28⅛	72⅜	15.72	72⅜	78¼	185½	186	20¼	4.40	20⅜	4.51
10	28⅛	71½	15.48	71½	77⅜	184½	184½	20⅛	4.37	20⅜	4.51
11	28¼	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
13	28¼	71⅛	15.45	71⅛	77	184	184½	20⅛	4.37	20½	4.45
14	28 1/16	70½	15.32	70½	77	184½	184½	19⅞	4.32	20½	4.45
15	28¼	71⅛	15.56	71 11/16	77¼	184⅞	185	19⅞	4.32	20⅛	4.48

The above table gives the closing quotations on the London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. Lead prices are for soft Spanish; Zinc prices for good ordinaries. For convenience in comparison of London with American prices, the ratio is: £1 per ton = 0.2173c. per lb., approximately, Cols., 3, 9 and 11 give the equivalent in cts. per lb. of the London price.

Other Metals

Aluminum—The market continues dull, with light sales. Quotations are a shade lower at 20@20½c. per lb. for No. 1 ingots, New York. The foreign market is reported firm.

Antimony—A fair business has been done chiefly in moderate sized orders. Cookson's is quoted at 7.50@7.70c. per lb.; Hallett's at 7⅛@7⅜c. Hungarian Chinese and other outside brands have been a little irregular; 6⅞@6⅝c. per lb. is now asked.

Quicksilver—Business is fair, but prices are rather lower. New York quotations are $38 per flask of 75 lb., with 55@56c. per lb. for retail lots. San Francisco, $38 for domestic orders; special terms for export. London, £7 5s. per flask, with £7 quoted from second hands.

Magnesium—Current price of pure metal is $1.50 per lb. for 100-lb. lots, New York.

Gold, Silver and Platinum

Gold—The price of gold on the open market in London remained steady at the Bank level, 77s. 9d. per oz. for bars, and 76s. 4d. per oz. for American coin. Egypt is still taking a large amount of gold, and Germany was also a buyer.

Imports of gold at New York week ended Oct. 11 were $453,694, chiefly from Cuba and South America. There were no exports.

Iridium—The price shows no change, dealers getting $83@85 per oz., New York.

Platinum—The market is rather unsettled yet, but the tendency is stronger. The leading dealers still ask $45, but sales have again been made at $43@44, which may be taken as the market. Hard metal is $49@52 per oz., according to grade.

Our Russian correspondent writes under date of Sept. 29, that decreased foreign demand and an increase in production brought about a decline from 9.75 to 9.35 rubles per zolotnik in August. In September the position has improved and current quotations for crude platinum, 83% metal, are 9.50 rubles per zolotnik—equal to $35.72 per oz.—at Ekaterinburg, and 36,400 rubles per pood—$35.67 per oz.—for large quantities of the same grade at St. Petersburg.

Silver—The market is quiet around 28¼d. Change in price depends largely upon the action of China. The chances are that the India government will not soon be in the market again; but possibly later in the fall, additional purchases may be made on that account.

Shipments of silver from London to the East, Jan. 1 to Oct. 2, as reported by Messrs. Pixley & Abell:

	1912	1913	Changes
India	£7,843,200	£6,189,000	D. £1,654,200
China	933,500	652,000	D. 281,500
Total	£8,776,700	£6,841,000	D.£1,935,700

Exports of silver from New York week ended Oct. 11 were $1,010,702, all to London and Paris. Imports were $143,132 in value.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Oct. 11

The base price pid this week for 60% zinc ore was $42@43 per ton. The base price paid for 80% lead ore was $55 per ton.

SHIPMENTS WEEK ENDED OCT. 11

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,113,650	120,700	1,331,930
Year to date	116,415,560	5,416,340	46,453,540

Shipped during week to separating plants, 2,996,300 lb. zinc ore.

JOPLIN, MO.—Oct. 11

The high price of zinc blende is $47, the base per ton of 60% zinc, $40@44 for choice grades. Concentrates carrying over 4% iron sold on a metal base of $41@42. In such buying only an assay for zinc content is made and the price based on the metal thus shown, no account of the iron content being considered. Such buying, on the blende bought by this method, is equivalent to a base of $45@46 on the present market, if the iron was assayed and deducted. Despite the declining price of blende no change is made in calamine, which is still selling at $21@23 per ton of 40% zinc, and the average of all grades is $41.60 per ton. Lead sold as high as $58, on a metal base of $54 for concentrates 80% lead. The average of all grades is $54.68 per ton.

SHIPMENTS WEEK ENDED OCT. 11

	Blende	Calamine	Lead	Value
Total sales this week	9,887,430	761,410	1,965,160	$276,385
Total sales 41 weeks	449,204,550	32,912,160	74,000,720	12,266,549

Blende value, the week, $212,220; 41 weeks, $9,865,246. Calamine value, the week, $10,335; 41 weeks, $425,084. Lead value, the week, $53,830; 41 weeks, $1,976,219.

IRON TRADE REVIEW

NEW YORK—Oct. 15

The United Statese Steel Corporation's tonnage report for September proved unexpectedly favorable, the unfilled tonnage at the close of the month being 5,003,785 tons, indicating a loss during the month of 219,683 tons, when a loss of 300,000 to 400,000 tons had been forecasted. It is estimated that the corporation ran at 92% of rated capacity, which means practically full, and booked a tonnage equal to about 74% of capacity, or about 80% of the actual shipments, a very good showing in view of current pessimistic reports as to trade activity. It is thought that the corporation's selling policy is more aggressive than that of the independents.

The passage of the new tariff has thus far occasioned no material readjustments in prices. The market continues to show a sagging tendency, but this can be explained by current trade conditions. Orders being placed are for immediate shipment, for which foreign steel could hardly be considered. The whole market is waiting, with eyes upon the railroads as likely to furnish the first important forward buying.

Pig iron in Eastern territory shows an additional number of sales and better demand, both for foundry and basic pig. Prices are generally firm. The putting of pig iron on the free list seems to have had little or no effect on the market.

Pig-Iron Production—The statements of the blast furnaces, as collected and published by the "Iron Age," show that on Oct. 1 there were 256 coke and anthracite stacks in blast with a total capacity of 83,375 tons daily; an increase of 975 tons over Sept. 1. Making allowance for the charcoal furnaces, the estimated make of pig iron in September was 2,541,000 tons; for the nine months ended Sept. 30, it was 24,220,700 tons. Of this total 16,969,200 tons, or 70.1%. were made by the furnaces owned or operated by steel companies.

PITTSBURGH—Oct. 14

Among the Pittsburgh and Valley mills there are no definite signs of the curtailment in output, which has been so long predicted. The mills seem still able to maintain practically full operations, though, of course, they are not running under extreme pressure, and it is admitted that in the majority of lines they have to make up their rolling schedules from week to week, having no accumulation of specifications except such as are dated for shipment at specified intervals. In some lines there remains an accumulation. The Carnegie Steel Co. is filled on structural shapes for three months, and on new orders cannot promise any earlier delivery than January. In merchant bars most of the mills are almost filled for as long a time. In wire products shipments are heavy, but the high point in the mill movement against the fall trade has now been passed. Tinplate specifications are relatively light, and production is at about 75% of capacity, the same being true of sheets. Plates are more frequently than formerly sold under 1.40c., while 1.40c. has become very common on shapes. Bars remain firm at 1.40c., but there is little new business to test the market; specifications against old contracts are good.

Pig Iron—The market continues stagnant, and with not enough nnquiry to develop what prices could really be done in bessemer or basic. In foundry iron limited inquiry has developed Valley quotations 15c. below the former market of $14. On the whole the furnaces are standing quite firm. The market stands quotable as follows, though quotations are largely nominal: Bessemer, $15.75; basic, $14; malleable, $14.25; No. 2 foundry, $13.85@14; forge, $13.50, f.o.b. Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market has been quiet, but there are rumors of small lots having been sold at slight cuts. The regular quotation for prompt or forward is $50, Baltimore, with $2.16 freight to Pittsburgh.

Steel—The market continues soft, but definite market prices are difficult to quote since the mills are making liberal adjustments with their contract customers and thus preventing much inquiry from coming into the market. A round quotation is $23 for billets and $24 for sheet bars, at bessemer or openhearth, at maker's mill, Pittsburgh or Youngstown, but these prices could doubtless be shaded 50c. or more on inquiry for any desirable tonnage. Rods are weak at $26.50, Pittsburgh.

IRON ORE

Settlements for imported ore in the East are now being made at 12c. off for Cuban and 15c. for other ore, the duty being removed.

Lake Superior iron ore shippers have notified owners that they will move all the ore contracted for and that they need expect no cut in allotments this fall. The announcement was a surprise to vessel owners.

Shipments of Lake Superior iron ore by ports for the season to Oct. 1 are reported by the "Iron Trade Review" as follows, in long tons:

Port	1912	1913	Changes
Escanaba	4,010,985	4,297,223	I. 286,238
Marquette	2,567,578	2,573,604	I. 6,026
Ashland	3,623,161	3,558,802	D. 64,359
Superior	11,097,276	10,810,391	D. 286,885
Duluth	7,729,187	9,830,726	I. 2,101,539
Two Harbors	7,310,195	8,194,738	I. 884,543
Totals	36,338,382	39,265,484	I. 2,927,102

The total September shipments were 7,258,413 tons. Deliveries to Lake Erie ports for the month were 6,047,446 tons, or 83.3% of the total.

COKE

The coke market is still unsettled, though strong efforts are being made by the Connellsville producers to maintain the price.

Coal Consumption in France half-year ended June 30, metric tons:

	1912	1913	Changes
Coal mined	20,194,394	20,611,592	I. 417,198
Imports	9,059,300	11,344,200	I. 2,284,900
Total	29,253,694	31,955,792	I. 2,702,098
Exports	1,251,034	891,914	D. 359,120
Consumption	28,002,660	31,063,878	I. 3,061,218

No allowance is made for stocks carried, but it is believed that there was no increase in these this year.

Fuel Exports and Imports in Germany seven months ended July 31, in metric tons:

	Exports	Imports	Excess
Coal	19,399,643	6,078,982 Exp.	13,320,661
Brown coal	36,779	4,147,033 Imp.	4,110,254
Coke	3,972,676	353,585 Exp.	3,619,091
Briquettes	1,892,186	82,414 Exp.	1,809,742
Total	25,301,284	10,662,014 Exp.	14,639,270

Of the briquettes exported this year 496,775 tons were made from brown coal or lignite.

SAULT STE. MARIE CANAL TRAFFIC

The movement of freight through the Sault Ste. Marie Canals in August was 11,489,442 short tons. For the season to Sept. 1 the total movement was:

	1912	1913	Changes
East-bound	31,315,627	35,656,964	I. 4,341,337
West-bound	10,169,299	13,505,965	I. 3,336,666
Total	41,484,926	49,162,929	I. 7,678,003

The total number of vessel passages this year was 14,290, giving an average cargo of 3440 tons. The mineral freights included in the totals were, in short tons except salt, which is in barrels:

	1912	1913	Changes
Coal	8,990,020	12,362,602	I. 3,372,582
Iron ore	27,753,132	30,814,562	I. 3,061,430
Pig and manuf. iron	378,163	238,069	D. 140,094
Copper	60,772	68,931	I. 8,159
Building stone	2,282	5,973	I. 3,691
Salt, bbl.	405,742	448,272	I. 42,530

Iron ore was 62.7% of the total freight and coal 25.2%, this year.

CHEMICALS

NEW YORK—Oct. 15

The general market continues fairly active with a good deal of business forward.

Arsenic—The market remains quiet and quotations are about the same, $3@3.25 per 100 lb. being asked. Some German material is being dumped on this market.

Copper Sulphate—The market is steady and fairly active. Prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—There has been rather a break in the market. During the recent rush of orders in Europe, it appears that jobbers overbought from importers, and the importers from producers. A sudden stop of orders brought about a collapse in prices. Current quotations are unsettled; 2.25c. per lb. is asked for spot, 2.30c. for November, 2.32½c. for December, and 2.37½c. for January and forward deliveries.

PETROLEUM

Production of oil in California in August was 8,807,186 bbl.; deliveries, 8,502,110 bbl. The number of new wells completed during the month was 50. There were 63 new rigs put up and started drilling.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	May	June	July	August	September
Alaska shipments	1,771,508	2,203,191	2,705,136	1,847,785	2,261,216
Anaconda	25,600,000	21,500,000	22,103,000	22,500,000	.....
Arizona, Ltd.	3,200,000	2,600,000	2,600,000	1,800,000	1,800,000
Copper Queen	8,301,605	7,477,936	8,369,607	8,252,404	.....
Calumet & Ariz.	4,300,000	4,000,000	3,800,000	4,500,000	4,000,000
Chino	3,883,611	3,682,706	4,831,185	6,050,867	4,308,296
Detroit	2,001,633	1,750,601	1,549,224	2,187,223	.....
East Butte	1,268,595	1,055,646	1,060,257	1,162,007	.....
Giroux*	625,000	610,000	610,000	605,000	.....
Mason Valley	1,186,560	1,097,014	908,892	867,060	.....
Miami	1,943,900	2,612,000	.....	.....	.....
Mammoth	1,700,000	1,750,000	1,800,000	1,750,000	1,750,000
Nevada Con.	5,933,275	6,344,863	5,403,919	5,989,973	.....
Ohio	650,071	537,400	601,700	689,000	685,900
Old Dominion	2,749,000	2,511,000	2,526,000	2,524,000	2,679,000
Ray	4,384,400	4,392,612	4,097,000	4,269,519	.....
Shannon	1,080,000	924,000	880,000	1,248,000	1,232,000
South Utah	200,000	185,000	140,000	223,498	.....
Tennessee	§1,037,115	1,379,220	1,247,804	1,101,019	1,309,985
United Verde*	3,000,000	2,900,000	3,000,000	3,000,000	.....
Utah Copper Co.	10,003,227	11,637,949	9,849,043	10,302,251	.....
Lake Superior*	18,705,000	16,500,000	17,500,000	9,700,000	6,950,000
Non-rep. mines*	6,300,000	6,000,000	6,200,000	6,200,000	.....
Total prod.	109,824,500	104,051,138	101,758,167	96,769,606	.....
Imports, bars, etc.	22,205,942	18,255,267	29,029,990	.....	.....
Total blister.	132,030,442	122,306,405	130,788,157	.....	.....
Imp. ore & matte.	10,528,562	7,497,002	8,527,046	.....	.....
Total Amer.	142,559,004	129,803,407	139,315,203	.....	2,688,000
Miami†	.....	.....	2,890,000	3,097,500	.....
Shattuck-Arizona	1,026,170	1,059,625	1,019,388	1,001,634	.....
Brit. Col. Cos.:					
British Col. Cop.	618,076	634,238	618,379	.....	.....
Granby	1,782,570	1,789,000	1,664,102	1,847,344	1,824,659
Mexican Cos.:					
Boleo†	2,424,800	1,984,640	2,240,720	2,264,640	.....
Cananea	2,272,000	2,908,000	3,328,000	3,186,000	3,148,000
Moctezuma	2,695,881	3,438,793	2,693,006	3,542,047	.....
Other Foreign:					
Braden, Chile	1,150,000	1,804,000	1,046,000	1,572,000	1,332,000
Cape Cop., S. Af.	387,520	414,400	.....	.....	.....
Kyshtim, Russia	1,490,000	1,000,000	2,500,000	.....	.....
Spassky, Russia	721,280	835,520	660,800	1,048,320	.....
Exports from					
Chile	3,584,000	5,824,000	9,856,000	8,736,000	5,600,000
Australia	7,840,000	7,616,000	10,304,000	7,720,000	6,944,000
Arrivals-Europe‡	13,661,760	5,277,440	11,728,640	14,624,960	9,661,120

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

‡ Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

	United States			Visible Stocks.		
Month	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
IX, '12	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,382	78,491,840	183,904,422
II	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	131,401,229	66,836,897	73,085,275	38,314,037	63,716,800	102,030,837
X	.....	.....	.....	29,793,094	53,625,600	83,418,694

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Mining Companies—United States

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt.
Acacia, g.	Colo.	1,438,989	$ 1	$ 129,618	Jan '11	$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	50,000	25	1,950,000	July '13	5.00
Alaska Mexican, g.	Alas.	180,000	5	3,241,381	Aug. '13	0.30
Alaska Treadwell, g.	Alas.	200,000	25	13,385,000	Aug. '13	1.00
Alaska United, g.	Alas.	180,200	5	1,397,150	Aug. '13	0.60
Am. Zinc, Lead & Sm.	U. S.	165,360	25	985,820	Apr. '13	0.50
Anaconda, c.	Mont.	4,332,500	25	78,168,750	July '13	0.75
Argonaut, g.	Calif.	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf.	Ariz.	1,426,120	1.20	1,831,011	May '13	
Arizona Copper, com.	Ariz.	1,519,896	1.20	15,983,475	July '13	0.48
Bagdad-Chase, g., pf.	Calif.	84,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,750,000	Dec. '12	7.00
Bingham N. H., c.	Utah	228,690	5	317,088	Sept. '13	0.10
Bonanza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Calif.	200,000	1	771,000	Sept. '13	0.05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	14,500,350	Sept. '13	0.20
Butte-Alex Scott, c.	Mont.	74,000	10	111,000	June '13	0.50
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	596,353	10	15,179,882	Sept. '13	1.25
Calumet & Hecla, c.	Mich.	100,000	25	122,650,000	Sept. '13	10.00
Camp Bird, g.s.	Colo.	1,100,051	5	9,650,812	Aug. '13	0.24
Center'l-Eur., l.s.g.c.	Utah	100,000	5	3,750,000	Apr. '13	1.50
Center Creek, l.z.	Mo.	100,000	10	425,000	July '13	0.05
Champion, c.	Mich.	100,000	25	8,000,000	June '13	1.00
Chief Consolidated, s.g.l.	Utah	876,453	1	175,290	Sept. '13	0.10
Cliff, g.	Utah	300,000	1	120,000	Jan. '13	0.10
Cliff, g.	Alas.	100,000	1	180,000	Nov. '12	0.05
Colo. Gold Dredging	Colo.	100,000	10	300,000	Aug. '13	0.25
Colorado, l.s.g.	Utah	1,000,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah	285,540	5	226,832	Oct. '07	0.20
Commercial Gold	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur, g.	Utah	1,000,000	1	3,415,313	July '12	0.03
Continental, z.l.	Mo.	22,000	25	297,000	July '13	0.50
Copper Range Con., c.	Mich.	393,445	100	13,788,175	July '13	0.75
Daly Judge, s.l.	Utah	300,000	1	585,000	June '13	0.15
Daly West, s.l.	Utah	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g.	Colo.	3,000,000	0.10	45,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,782	100	3,500,974	Sept. '13	1.00
Elkton Con., g.	Colo.	2,500,000	1	3,079,460	Aug. '13	0.02
El Paso, g.	Colo.	490,000	5	1,658,545	Mar. '13	0.12½
Ernestine, g.s.	N.M.	300,000	5	400,000	Dec. '12	0.00½
Fed. M. & S., com.	Idaho	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho	120,000	100	9,207,851	Sept. '13	1.50
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	206,000	Sept. '13	0.02
Frontier, s.	Wis.	1,250	100	173,772	Sept. '13	2.00
Gemini-Key'ne, l.g.s.	Utah	5,000	100	2,110,000	May '13	10.00
Gold Chain, g.	Utah	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	100,000	Dec. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,531,000	Sept. '13	0.02
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	24,906,811	Apr. '13	0.30
Grand Central, g.	Utah	500,000	1	1,545,750	Sept. '13	0.05
Granite, g.	Colo.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	873,000	Nov. '12	0.01
Hecla, l.s.	Idaho	1,000,000	0.25	2,910,000	Sept. '13	0.02
Hercules, l.s.	Idaho	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,400	100	33,531,045	Sept. '13	0.65
Horn Silver, l.s.z.	Utah	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	216,832	July '13	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah	1,000,000	0.10	1,670,000	July '13	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,700,000	Apr. '13	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	150,000	Aug. '11	0.01
Kendall, g.	Mont.	500,000	5	1,475,000	Nov. '12	0.02
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquette, z.l.	Wis.	20,000	1	162,500	Dec. '12	0.50
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g.	Colo.	130,551	5	522,093	Oct. '10	1.00
Little Bell, l.s.	Utah	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g.	Colo.	1,309,252	1	1,051,373	July '13	0.02
May Day, g.s.l.	Utah	800,000	0.25	148,000	Feb. '13	0.03
Mexican, g.s.	Nev.	201,600	2.50	20,160	Aug. '11	0.10
Miami, c.	Ariz.	664,993	5	2,216,708	Aug. '13	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk, c.	Mich.	100,000	25	3,175,000	Aug. '13	2.00
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	530,000	Dec. '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,394	5	12,987,776	Sept. '13	0.37½
New Century, z.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,720,000	Sept. '13	0.10
North Butte, c.	Mont.	410,000	15	11,070,000	July '13	0.50
North Star, g.	Cal.	250,000	10	3,936,989	Sept. '13	0.20
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,158,500	July '13	1.25
Ophir, s.g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging	Cal.	700,000	5	1,383,036	Dec. '09	0.12½
Osceola, c.	Mich.	96,150	25	11,698,925	July '13	3.00
Parrot, c.	Mont.	229,850	10	7,255,750	May '13	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	4,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Ida.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g	Nev.	2,790,000	1	667,600	Sept. '13	0.02
Portland, g.	Colo.	3,000,000	1	9,337,080	Aug. '13	0.02
Quilp	Wash.	1,500,000	1	67,500	Feb. '13	0.01
Quincy, c.	Mich.	110,000	25	20,842,500	Sept. '13	1.25
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.z.	Mo.	4,900	100	188,396	Dec. '10	0.50
Round Mountain, g.	Nev.	866,426	1	363,365	Aug. '13	0.04

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Par	Dividends Total	Latest	Amt
Seven Troughs Coal., g.	Nev.	1,500,000	$ 1	$ 37,500	July '12	$0.02½
St. Joseph, l.	Mo.	1,000,000	10	8,960,357	Sept. '13	0.10
Shannon, c.	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	1,400,000	July '13	0.50
Silver King Coal, l.s.	Utah	1,250,000	5	2,159,885	Apr. '13	0.15
Sioux Con., s.l.g.	Utah	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	275,000	May '12	0.02½
Smuggler, l.s.z.	Colo.	1,000,000	1	2,235,000	Nov. '06	0.03
Snowstorm, c.g.	Ida.	1,500,000	1	1,169,610	July '13	0.01½
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,229,809	Jan. '12	0.10
Stratton's Ind., g.	Colo.	1,000,000	0.60	486,000	May '13	0.06
Success, z.	Ida.	1,500,000	1	925,000	May '13	0.02
Superior & Pitts., c.	Ariz.	1,499,793	10	5,369,262	Sept. '13	0.38
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	3,631,520	Sept. '13	0.75
Tomboy, g.s.	Colo.	300,000	4.85	3,069,090	June '13	0.48
Tom Reed, g.	Ariz.	909,555	1	1,482,439	Sept. '13	0.06
Tonopah Belm't, s.g.	Nev.	1,500,000	1	4,718,003	July '13	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	377,370	July '13	0.02½
Tonopah of Nev., s.g.	Nev.	1,000,000	1	10,850,000	July '13	0.40
Tri-Mountain, c.	Mich.	100,000	25	1,250,000	Dec. '12	3.00
Tuolumne, c.	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g.s.l.	Utah	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	120,000	July '13	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	1,357,500	July '13	7.50
United Verde, c.	Ariz.	300,000	10	32,572,000	Aug. '13	0.75
Utah, s.l.	Utah	100,000	10	325,000	Dec. '10	0.02
Utah, c.	Utah	1,562,599	10	19,803,111	Sept. '13	0.75
Utah Con., c.	Utah	300,000	5	7,800,000	July '13	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,722,000	July '13	0.03
Wasp No. 2, g.	S. D.	500,000	1	431,965	Sept. '13	0.02
Wellington Mines, g.	Colo.	10,000,000	1	260,000	July '13	0.00½
Wolverine, c.	Mich.	60,000	25	7,940,000	Apr. '13	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Colo.	1,000,000	1	1,727,655	July '13	0.02
Yankee Con., g.s.	Utah	1,000,000	1	167,500	Jan. '13	0.01
Yellow Aster, g.	Cal.	100,000	10	1,166,789	Sept. '13	0.05
Yellow Pine, l.z.s.	Nev.	950,000	1	294,508	Sept. '13	0.02
Yukon Gold, g.	Alas.	3,500,000	5	5,250,000	Sept. '13	0.07½

Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	$100	$78,968,110	Aug. '13	$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	24,833,333	Sept. '13	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	45,481,333	Sept. '13	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	7,875,000	July '13	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	11,982,000	July '13	1.25
Cambria Steel	Penn.	900,000	50	17,897,500	Aug. '13	0.62½
Greene Cananea	U. S.	2,471,314	25	2,426,877	Mar. '13	0.25
Guggenheim Expl.	U. S.	831,732	25	16,977,248	Sept. '13	0.62½
Inter'l Nickel, com.	U. S.	115,826	100	10,089,316	Sept. '13	3.00
Inter'l Nickel, pfd.	U. S.	89,126	100	4,140,503	Aug. '13	1.50
Inter'l Sm. & Ref.	U. S.	100,000	100	3,300,000	Aug. '13	2.00
National Lead, com.	N. Y.	206,554	100	7,540,308	Sept. '13	0.75
National Lead, pf.	N. Y.	243,676	100	27,560,940	Sept. '13	1.75
Old Dominion, c.	Ariz.	293,245	25	4,313,579	July '13	1.25
Phelps, Dodge & Co.	U. S.	450,000	100	28,309,304	Sept. '13	4.50
U. S. Steel Corp., com.	U. S.	5,083,025	100	194,403,851	Sept. '13	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	338,768,739	Aug. '13	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,320	50	5,308,851	July '13	0.75
U. S. S., R. & M., pf.	U.S.-Mex.	351,105	50	12,539,695	July '13	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$ 5	$ 200,000	Oct. '12	$0.25
Amparo, g.s.	Mex.	2,000,000	1	1,166,884	Aug. '13	0.04
B. C. Copper	B. C.	591,709	5	615,398	Jan. '13	0.15
Beaver Con., s.	Ont.	1,996,490	1	409,879	Dec. '12	0.03
Buffalo, s.	Ont.	1,000,000	1	2,907,000	Aug. '13	0.03
Cobalt Townsite, s.	Ont.	1,000,000	1	450,000	Aug. '13	0.24
Coniagas, s.	Ont.	800,000	5	5,000,000	Aug. '13	0.45
Con. M. & S. Co. of Can.	B. C.	58,052	100	1,120,165	July '13	2.00
Crown Reserve, s.	Ont.	1,768,814	1	5,341,820	Sept. '13	0.02
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dominion Coal, com.	N. S.	150,000	100	5,550,000	Jan. '13	1.00
Dominion Coal, pf.	N. S.	50,000	100	4,915,000	Aug. '12	3.50
Dos Estrellas, g.s.	Mex.	300,000	0.50	14,580,000	Sept. '13	1.25
El Oro, g.s.	Mex.	1,147,500	4.85	8,947,261	July '13	0.24
Esperanza, s.g.	Mex.	455,000	4.85	11,330,455	July '13	0.36
Granby, s.l.c.	B.C.	148,496	100	5,364,794	Sept. '13	1.50
Greene Con., c.	Mex.	1,000,000	10	8,044,400	Feb. '13	0.45
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold	B. C.	120,000	10	1,044,000	Sept. '13	0.50
Hollinger, g.	Ont.	600,000	5	1,080,000	Sept. '13	0.15
Kerr Lake s.	Ont.	600,000	5	4,770,000	Sept. '13	0.25
La Rose Con., s.	Ont.	1,498,407	5	4,263,147	July '13	0.25
Le Roi No. 2, g.	B. C.	120,000	24.30	1,471,580	Jan. '13	0.36
Lucky Tiger Com., g.	Mex.	715,337	10	1,922,865	Sept. '13	0.05
McK.-Dar. Sav. s.	Ont.	2,247,692	1	3,663,165	July '13	0.10
Mines Co. of Am. (new)	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros.	C. A.	150,000	10	3,192,500	Sept. '13	0.20
Nipissing, s.	Ont.	1,200,000	5	10,440,000	July '13	0.37½
Peñoles, s.l.g.	Mex.	80,000	25	6,551,688	Sept. '13	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	600,000	Oct. '11	3.00
Right of Way Mns†s.	Ont.	1,685,500	1	202,260	Dec. '11	0.02
Rio Plata, s.	Mex.	373,437	5	345,714	Feb. '13	0.05
San Rafael, g.s.	Mex.	2,400	25	1,439,780	Oct. '12	0.90
San Toy, g.s.	Mex.	6,000,000	1	540,000	July '13	0.01
Sopresa, g.s.	Mex.	19,200	20	1,517,438	Jan. '11	34.00
Stand'd Silver-Lead.	B. C.	2,000,000	1	875,000	Sept. '13	0.02½
Timiskaming, s.	Ont.	2,500,000	1	1,534,155	Apr. '13	0.06
Tem. & Hud. Bay, s.	Ont.	7,761	1	1,823,835	Aug. '13	3.00
Trethewey, s.	Ont.	1,000,000	1	961,998	Jan. '13	0.10
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	566,636	Jan. '13	0.05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644.

Assessments

Company	Delinq.	Sale	Amt.
Arizona Enterprise, Ariz.	Oct. 10	Oct. 31	$0.005
Big Elk, Ida.	Oct. 13	Nov. 5	0.001
Challenge, Nev.	Sept. 30	Oct. 21	0.05
Cons. Virginia, Nev.	Oct. 3	Oct. 24	0.10
Demijohn Cons., Utah	Oct. 17	Nov. 4	0.0025
Honolulu, Ida.	Sept. 23	Oct. 24	0.0011
Hypotheek, Ida.	Oct. 9	Nov. 4	0.004
Michigan Copper & Gold, Utah	Oct. 8	Oct. 25	0.0025
Midnight Bell, Utah	Oct. 1	Oct. 20	0.0015
Montello, Utah	Oct. 11	Nov. 1	0.005
Moonlight, Ida.	Sept. 30	Oct. 30	0.005
Overman, Nev.	Oct. 2	Oct. 23	0.05
Raymond-Illinois, Utah	Oct. 11	Oct. 27	0.005
Royal Copper, Ida.	Sept. 29	Oct. 29	0.001
Saltese, Ida.	Sept. 27	Oct. 25	0.002
Sandstorm-Kendall, Nev.	Sept. 19	Oct. 24	0.01
Santaquin Chief, Utah	Oct. 13	Oct. 31	0.0025
Santaquin King, Utah	Oct. 9	Oct. 27	0.0025
Sierra Nevada, Nev.	Sept. 25	Oct. 25	0.10
Sunrise, Ida.	Sept. 28	Oct. 28	0.002
Sunset, Ida.	Oct. 18	Nov. 12	0.002
Tar Baby, Utah	Sept. 29	Nov. 3	0.0025
Tintic Standard, Utah	Oct. 11	Nov. 1	0.005
Tuscumbia, Ida. (postpo'd)	Aug. 23	Oct. 23	0.003
Utah-Arizona, Ariz.	Oct. 15	Oct. 31	0.005
Utah United, Utah	Oct. 11	Nov. 1	0.01
West Century, Utah	Oct. 1	Oct. 30	0.01

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	60.640	24.209	29.088	27.986
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	16.328	17.698	16.799	78.762	73.125
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.140
March	42.577	46.832	192.619	213.615
April	43.923	49.115	200.513	224.159
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	42.410	223.762	193.074
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	4.698	4.924	4.579	22.292	20.648
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	5.694	7.313	5.544	27.048	21.148
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	16.65	16.03	15.04	15.63	14.93
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Oct. 14

Name of Comp.	Bid.
Acacia	.02½
Cripple Cr'k Con.	.01
C. K. & N.	.09
Doctor Jack Pot	.06½
Elkton Con.	.53
El Paso	2.90
Findlay	‡.02½
Gold Dollar	.06½
Gold Sovereign	.02½
Isabella	.09½
Jack Pot	.05
Jennie Sample	.05
Jerry Johnson	.03½
Lexington	‡.005
Moon Anchor	‡.006
Old Gold	.01½
Mary McKinney	.55½
Pharmacist	.01½
Portland	.97
Vindicator	.84

SALT LAKE Oct. 14

Name of Comp.	Bid.
Beck Tunnel	.05
Black Jack	.08½
Cedar Talisman	.00½
Colorado Mining	.10
Columbus Con.	‡.00½
Crown Point	.00½
Daly-Judge	6.00
Grand Central	.48
Iron Blossom	1.15
Little Bell	‡.10
Lower Mammoth	.00½
Mason Valley	2.00
May Day	.05½
Nevada Hills	.75
New York	‡.03
Prince Con.	.30
Silver King Coal'n.	3.52½
Sioux Con.	.01
Uncle Sam	.05
Yankee	‡.08

TORONTO Oct. 11

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.06	Foley O'Brien	.18
Coniagas	7.50	Hollinger	16.85
T. & Hudson Bay	‡70.00	Imperial	‡.02
Timiskaming	.18	Jupiter	.10
Wettlaufer-Lor.	.07	Pearl Lake	.17
Apex	‡.01	Porcu. Gold	.07
Big Dome	10.00	Preston E. D.	.03
Crown Chartered	‡.00½	Rea	.10
Dobie	.10	Swastika	.02
Dome Exten.	.07	West Dome	.08

SAN FRANCISCO Oct. 14

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.05	Belmont	6.80
Belcher	‡.21	Jim Butler	.60
Best & Belcher	.06	MacNamara	.08
Caledonia	2.05	Midway	.34
Challenge Con.	.11	Mont.-Tonopah	1.12½
Chollar	.03	North Star	.35
Confidence	.35	West End Con.	1.35
Con. Virginia	.16	Atlanta	.14
Crown Point	.30	Booth	.02
Gould & Curry	.03	C.O.D. Con.	.03
Hale & Norcross	.08	Comb. Frac.	.03
Mexican	1.12½	Jumbo Extension	.11
Occidental	.70	Pitts.-Silver Peak	.35
Ophir	.19	Round Mountain	.40
Overman	‡.50	Silver Pick	.04
Potosi	.03	Tramp Con.	‡.01
Savage	.07	Argonaut	2.75
Sierra Nevada	.10	Bunker Hill	1.75
Union Con.	.09	Central Eureka	.13
Yellow Jacket	.38	So. Eureka	2.00

N. Y. EXCH. Oct. 14

Name of Comp.	Clg.
Amalgamated	70⅞
Am. Agri. Chem.	42
Am.Sm.&Ref.,com.	62½
Am. Sm. & Ref., pf.	99½
Am. Sm. Sec., pf. B	81½
Anaconda	34½
Batopilas Min.	‡1⅛
Bethlehem Steel,pf.	69½
Chino	38½
Federal M. & S., pf.	38½
Great Nor.,ore,ctf.	31½
Guggen. Exp.	43½
Homestake	106
Inspiration Con.	15
Miami Copper	22½
Nat'l Lead, com.	44
National Lead, pf.	103
Nev. Consol.	15
Phelps Dodge	188
Pittsburg Coal, pf.	88½
Quicksilver, pf.	3
Ray Con.	18⅛
Republic I&S,com.	18½
Republic I&S, pf.	78
SlossSheffi'd,com.	29
Sloss Sheffield, pf.	88
Tennessee Copper	30
Utah Copper	51⅛
U. S. Steel, com.	54⅛
U. S. Steel, pf.	104½
Va.Car.Chem.,pf.	94

N. Y. CURB Oct. 14

Name of Comp.	Clg.
Ariz. Belmont	.13
Barnes King	1⅛
Beaver Con.	.29
Big Four	.19
Braden Copper	7
B. C. Copper	2⅛
Buffalo Mines	2⅛
Can. G. & S.	.17
Caribou	.55
Con. Ariz. Sm.	3/16
Davis-Daly	2⅛
Diam'field-Daisy	.02
Ely Con.	.06
Florence	.22
Giroux	1⅛
Gold Hill Con.	.21
Goldfield Con.	1 7/16
Greene Cananea	.30
Greenwater	.04
Internat. S. & R.	‡115
Kerr Lake	3⅛
Keystone	‡1⅛
La Rose	1 13/16
McKinley-Dar-Sa.	1⅛
Min. Co. of A. new	2⅛
Nipissing Mines	8⅛
Ohio Copper	7/16
Pacific Sm. & M.	‡⅛
Puebla S. & R.	2⅛
South Utah M&S.	3/16
Stand'd Oil of N.J.	378
Stewart	1 9/16
Tonopah	4⅛
Tonopah Ex.	1 11/16
Tonopah Merger	.58
Tri-Bullion	⅛
Tularosa	⅛
Union Mines	.08
United Cop., pfd.	3
Yukon Gold	2

LONDON Oct. 4

Name of Comp.	Clg.
Camp Bird	£0 16s 0d
El Oro	0 15 0
Esperanza	0 18 9
Mexico Mines	5 17 6
Oroville	0 5 6
Santa Gert'dis.	0 18 9
Stratton's	0 1 6
Tomboy	1 6 3

BOSTON EXCH Oct. 14

Name of Comp.	Clg.
Adventure	1⅛
Ahmeek	281
Alaska Gold M.	21⅛
Algomah	1⅛
Allouez	33⅛
Am. Zinc	18⅛
Ariz. Com., ctfs.	4⅛
Bonanza	.32
Boston & Corbin	.75
Butte & Balak	4
Calumet & Ariz.	62
Calumet & Hecla	410
Centennial	12⅛
Cliff	1⅛
Copper Range	38⅛
Daly West	2
East Butte	11⅛
Franklin	3
Granby	70½
Hancock	15
Hedley Gold	30
Helvetia	.25
Indiana	3⅛
Island Cr'k, com	48⅛
Island Cr'k, pfd.	83⅛
Isle Royale	18
Keweenaw	1⅛
Lake	8⅛
La Salle	3⅛
Mass	2
Michigan	1⅛
Mohawk	40⅛
New Arcadian	1⅛
New Idria Quick.	2⅛
North Butte	25⅛
North Lake	1⅛
Ojibway	.70
Old Dominion	47⅛
Osceola	76
Quincy	57
Shannon	6⅛
Shattuck-Ariz.	26⅛
Superior	23⅛
Superior & Bost.	2⅛
Tamarack	27⅛
Trinity	4⅛
Tuolumne	.60
U. S. Smelting	.37
U. S. Smelt'g, pf.	46⅛
Utah Apex	2
Utah Con.	8⅛
Victoria	1⅛
Winona	1⅛
Wolverine	.40
Wyandot	‡.50

BOSTON CURB Oct. 14

Name of Comp.	Bid
Bingham Mines	5⅛
Boston Ely	.49
Butte&Lon'nDev.	.27
Cactus	.02
Calaveras	1 5/16
Chief Cons.	1⅛
Corbin	.80
Cortez	.30
Crown Reserve	1⅛
Eagle & Blue Bell	.96
First Nat. Cop.	2⅛
Houghton Copper	.3⅛
Majestic	.24
Mexican Metals	.45
Moneta Porc.	‡.07
Nevada-Douglas	2
New Baltic	.60
Oneco	.80
Raven Copper	.07
Rhode Island Coal	.01
Smokey Dev.	.75
So. Lake	3⅛
S. W. Miami	‡1⅛
Tonopah Victor	.30
Trethewey	.28
United Verde Ext.	.50

‡Last Quotation.